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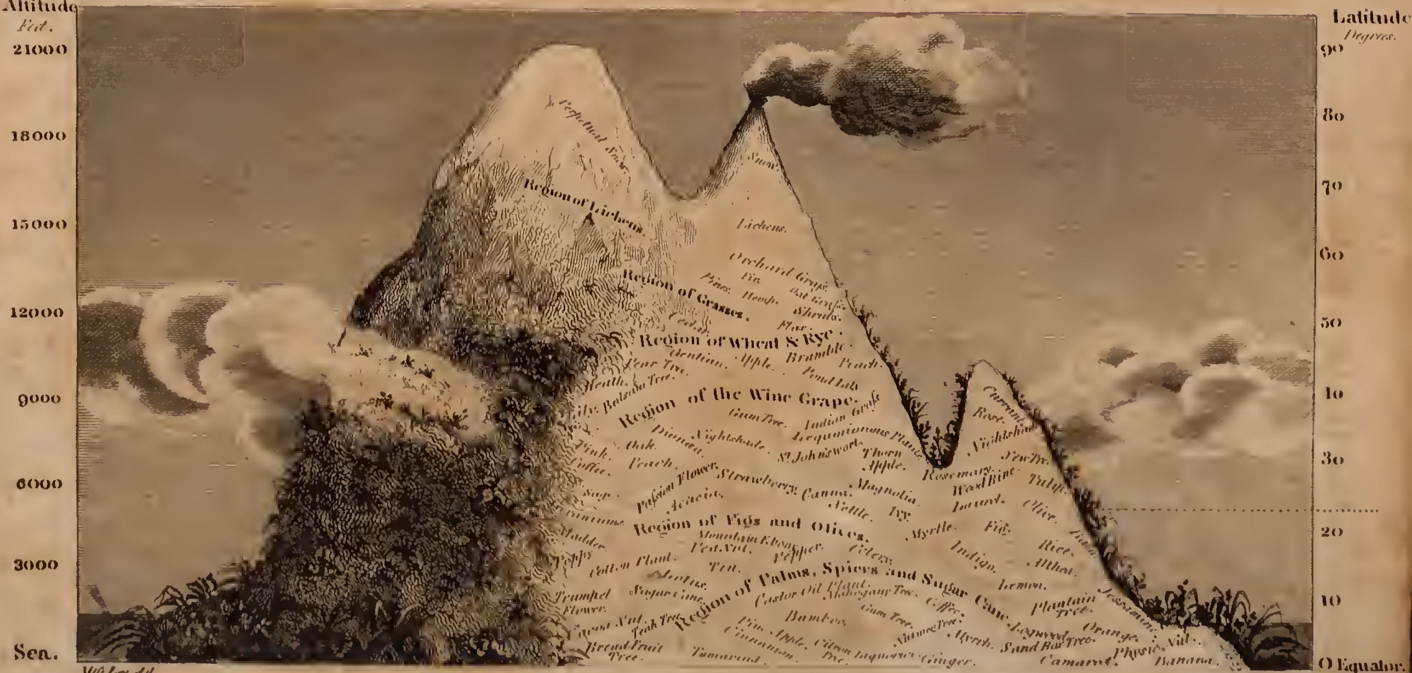
Top of Chimborazo 21000 feet from the level of the Sea: — Cotopaxi 18,876 Feet.— Plate 1.



Miss Lee del. Illman & Pilbrow Sc.

Progress of vegetation at different elevations, corresponding with its progress in different latitudes.

FAMILIAR LECTURES

ON

BOTANY.

INCLUDING

PRACTICAL AND ELEMENTARY BOTANY,

WITH

GENERIC AND SPECIFIC DESCRIPTIONS

OF

THE MOST COMMON NATIVE AND FOREIGN PLANTS,

AND

A VOCABULARY OF BOTANICAL TERMS.

FOR THE USE OF

HIGHER SCHOOLS AND ACADEMIES.

BY MRS. ALMIRA H. LINCOLN,
VICE-PRINCIPAL OF TROY FEMALE SEMINARY.

SECOND EDITION.

HARTFORD:
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TO

MY MOTHER,

MRS. LYDIA HEART.

Though a name conspicuous in the scientific world might add popularity to this little work now offered to the public; affection for my venerable parent induces me to dedicate to her, what will, to her, be interesting, however it may be regarded by the severe eye of criticism. I have, within the past year, seen in my sister's dedication to our aged Mother "*The History of the Republic of America*," that these marks of affectionate respect from her children have the power of awakening more vivid emotions in her breast than most events connected with a world, which has almost vanished from her sight in the brighter visions of eternity; that she may find the pious sentiments imbibed from herself, in some degree reflected from the following pages, is the wish of her

Daughter,

ALMIRA H. LINCOLN.

Troy Female Seminary, April 20, 1829.

PREFACE.

"A preface," says Smellie, the author of the "Philosophy of Natural History," "should contain an account of the circumstances and motives which induced an author to write upon that particular subject." The origin of the present volume, may be briefly traced. In the course of some years, devoted in part to the study of Botany, and with the charge of a large class, I found the want of a suitable book for beginners, and prepared for the use of my pupils a sketch, of which the following pages are but the filling up. The pupils were in the practice of copying the manuscript, but it required much time, and some of them expressed a wish that they might have the same in a printed form. With respect to botanical facts, I have no claim to any discoveries, neither have I ventured to make any innovations upon the science itself. The works of Mirbel, Demerson, Rosseau, St. Pierre, Smith, Thornton, Woodville, Eaton, Torrey, Bigelow, Nuttall, Elliot, Barton, Bartram, Sumner, and Locke; Encyclopædias and the Journal of Science, have been consulted. For the style, whatever may be its merits, or its faults; the arrangement of the work, and the application of botanical facts to the mind, either with a view of strengthening its reasoning faculties, or of inspiring devout affection, I consider myself as responsible. I have not intentionally copied from any work, without giving credit to the author. The History of botanical science, is in part translated from Mirbel's *Elemens de Botanique.*

The description of the genera and species of plants, with the Natural Orders of Linnæus and Jussieu, have been furnished me by Professor Eaton, to whom my thanks for this, and other kind offices are justly due.

It has been customary among botanical writers, to consider under separate heads, the physiology, anatomy, and classification of plants. This division, although proper in minute investigations upon physiology and anatomy, seems not well adapted for a school book. I have not therefore attempted to keep the departments separate.

This work has been prepared in intervals from duties connected with this institution, and while instructing in such branches of education, as required the best faculties of my mind; it is larger than was at first designed; it may be urged, that remarks are introduced not strictly connected with the subject, and that the substance of the book might be much condensed. In answer to this objection, I would remark, that from experience in teaching others, and from observation of the operations of my own mind, I am led to believe that books most remarkable for a concise style, are not the most favourable for the developement of the mind. If a book is to be committed to memory, every word, member of a sentence, or idea, not absolutely essential, should be excluded; but this fact with regard to education seems now to be generally understood, that the memory may be burdened without improving the other intellectual faculties, and that the best method of teaching, is that which tends most to develope, fertilize, and strengthen the mind.

A small text book, in a dry, concise style, may answer very well where a teacher has leisure and ability to amplify and explain; thus supplying to the pupils the want of an interesting book: yet with all this labour on the part of a teacher, a book containing interesting illustrations, would be desirable. But many teachers have neither the time, nor the confidence in themselves, to attempt to enlarge or illustrate: considering their duty as terminating in a faithful explanation of the book from which their pupils study.

It is desirable that school books should be easy to *teach*, and easy to *learn*.

The essentials for these purposes are,

1st. A clear and methodical arrangement of subjects.

2d. Perspicuity of language.

3d. A pleasing style, and interesting illustrations.

Whether I have attained to this standard, it remains for experience to determine.

But much as I have desired to aid the youthful mind in acquiring the elements of knowledge, still more have I desired to lead that mind to the fountain of all knowledge, to teach it to behold the providence of God as ever active, and watchful over all, even the least of his works.

I am greatly indebted to the kindness of Dr. Robbins, who amidst the fatigue of professional duties, has performed a service, for which, by long and close study of the ancient languages, he is peculiarly well qualified, that of accenting the genera and species of plants annexed to these lectures. This it is believed will prove of great utility both to teachers and pupils; for without some guide, those who are unacquainted with the principles of accentuation in the Latin and Greek languages, are liable to many mistakes in pronouncing botanical names.

The plates which accompany this work, have been taken from drawings, executed expressly for this purpose by Miss Thirza Lee, teacher of drawing in the Seminary.

PREFACE

TO THE SECOND EDITION.

The former edition of this work was presented to the public with many fears and much hesitation; the favorable reception which it received, was therefore gratifying, in proportion as it was unexpected. The encouraging voice and approving smile of our fellow travellers in the journey of life, have a powerful influence in exciting us to greater efforts; and while the virtuous mind would fear to indulge in an inordinate love of human applause, it must feel that the approbation of the good on earth, is a pledge of that higher reward which awaits it hereafter. These Lectures, although written with a view to teach science, have yet a higher aim, that of leading the youthful mind to view the wisdom, power and goodness of the Almighty, as manifested in his creation—and no commendation which this work has received, has been so gratifying to its author, as that, which has ascribed to it a religious tendency.

Since the publication of this elementary work, the science of which it treats has been introduced, as a study, into many of our principal female seminaries; and in the various applications for teachers, which are made to this institution from different parts of the country, an acquaintance with Botany is now, often made an indispensable qualification. It was the difficulty of procuring a female instructer in this department which led the author of these lectures to apply herself to the study of a science, whose beauties until recently have been concealed from general observation.

In this edition care has been taken to profit by the remarks of teachers and others who have used the work. A full *index* for the purpose of convenient reference has been added, and also a *table of contents*, which, through mistake, was omitted in the former edition. In that edition it was remarked that all descriptions of genera and species of plants were quoted from *Eaton's Manual*, with the consent of the Professor, and mostly from his own selection; at the request of teachers and others some additions are now made to this department; these are from Persoon, Torrey and Eaton. The author for this part of the work is indebted to the assistance of a scientific friend.

The Physiological department is rendered more full, by additional remarks upon the *growth of plants*, *circulation of fluids*, *Mirbel's arrangements of fruits*, &c. The *wood cuts* which are now added to the engravings, will, it is thought, be found useful for purposes of illustration. The analysis of subjects is now placed at the bottom of each page, as being there, more convenient for reference, than at the end of the book.

To some scientific gentlemen, who in condescending to notice so unpretending a volume, have suggested the propriety of rendering it more strictly scientific, the author would reply, that from the first it was only intended as a popular *introduction* to the science. No one department is considered as complete; the botanical descriptions do not include *all* the plants of any one section of the country, but some of the *most common* indigenous and exotic plants of the various botanical districts of the United States; such, as it is supposed, teachers can easily procure for analysis in their classes. Pupils going into the fields to collect plants should be provided with a Flora of the region in which they attempt to botanize*; teachers for their own private use, should be furnished with some work containing descriptions of all the plants of the country, as Eaton's Manual, Torrey's Botany, &c.

To the errors of the first edition, the public have been truly lenient; and it is with regret that the author feels the necessity of asking for further indulgence; she was called upon to prepare for this edition, at a time, when (the Principal of the Institution being in Europe) cares and duties, peculiarly complicated, had devolved upon her. A mere *revision* and *correction* of the first edition might have been easily accomplished, but *additions* and *improvements* had suggested themselves, which the author was unwilling to omit; in pursuance of these views, it became necessary, to write the work in a great measure anew—the copy furnished the printers was less legible than if the whole had been manuscript, as the pages not entirely rewritten were much confused with erasures and interpolations. The printing having been executed at a distance, the author had not the opportunity of correcting some errors, which had escaped observation, notwithstanding great care taken in printing and proof-reading.

The present edition, embracing as full a developement of the various departments of Botany as seems desirable in an elementary book, it is not probable any important alterations will hereafter be made in this work.

Troy Female Seminary, April 25, 1831.

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* Professor Hitchcock's "*Catalogue of the Plants growing in the vicinity of Amherst College*," furnishes nearly all the indigenous plants which may be found in the Northern part of tho United States. This Catalogue is the fruit of twelve year's examination of plants, mado by the Professor, aided by several eminent botanists. Those are truly the benefaetors of seience, who thus add to its stores the result of patient and laborious observations of nature, whilst the retail dealers of what their industry has eollected, may be considered as filling a very subordinate, though, it may be, a useful station in this department of human knowledge.

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TO TEACHERS.

In offering this book as an assistance to Instructers, the Author hopes to have rendered the first principles of the Science of Botany, of easy attainment; and that Instructers, in the developement of the work, will find such methodical arrangements, and simple illustrations, as may render it easy for pupils, and agreeable to themselves.

The most proper time for commencing botanical studies, seems to be that of the opening of flowers in the spring; though, should circumstances render it desirable to commence in winter, every assistance thought necessary, is offered by drawings, and the representations of dissected plants. The arrangement of subjects might be altered in pursuing the study, *without the aid of natural flowers.* The second part, which treats of the various organs of plants, the formation of buds, and other subjects connected with vegetable physiology; the fourth part, which gives the history of science, with the distinctions in the kingdoms of nature, might be studied to advantage, before attending much to the principles of classification which are mostly illustrated in the first and third parts.

The Botanical Class in this Institution, has for some years past been composed of about forty pupils.* The method pursued in teaching, has been very laborious, as the want of suitable books, rendered it necessary for the Author of these Lectures, who has taken charge of the class, to devote much time and attention, in gleaning from different writers, such facts and principles as would illustrate the science, and make it interesting to the pupils. This work contains the substance of what has been thus collected, and the method in which those facts and principles have been illustrated and arranged. A brief view of the manner in which I have proceeded in teaching, may be satisfactory to those about to commence the science.

On the first meeting of the class, after some explanation as to the nature of the study they are about to commence, each member is presented with a flower for analysis. The flower selected is always a simple one, exhibiting in a conspicuous manner the different organs of fructification; the lily and tulip are both very proper for this purpose. The names of the different parts of the flower are then explained, each pupil being directed to dissect and examine her flower as we proceed. After noticing the parts of fructification, the pupils are then prepared to understand the principles on which the artificial classes are founded, and to trace the plant to its proper class, order, &c. At each step, they are required to examine their flowers, and to answer simultaneously the questions proposed; as, how many stamens has your flower? Suppose it to be a lily, they answer six. They are then told it is of the sixth class. How many pistils? They answer one—they are told it is of the first order. They are then directed to take their books and turn to the sixth class, first order, to find the genus. In each step, in the comparison, they are questioned as above described, until, having seen in what respects their plant agrees with each general division, and differs from each genus under the section in which it is found, they ascertain its generic name. They are taught in the same manner to trace out its species: their minds perceiving at each step, some new circumstances of resemblance or difference, until they come to a species, the description of which answers to the plant under consideration.

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*The summer term after the publication of the first edition of this work, the number was increased to 70.

Technical terms are explained as we proceed; and the advantage in this kind of explanation, over that of any abstract idea, is, that it is manifested to the senses of the pupils, by the object before them. If a teacher attempt to define the words, *reason*, *will*, &c. or any other abstract terms, there is danger that the pupil may, from misunderstanding the language used in the explanation, obtain but a very confused and imperfect idea of the term; and, indeed, what two authors or philosophers give the same definition to abstract terms? Though mankind do not, in the purely mental operations, exhibit an entire uniformity, yet, in their external senses, they seldom disagree. A flower which appears to one person to be composed of six petals, corolla bell-form, and of a yellow colour, is seen to be so by another. Pupils who find it difficult to understand their other studies, (which in early youth are often too abstract,) are usually delighted with this method of analyzing plants; they feel that they understand the whole process, by which they have brought out the result, and perhaps for the first time enjoy the pleasure of a clear idea upon a scientific subject.

It is necessary, before the meeting of the class, to have a suitable number of plants collected, so that all may have specimens. In examining the pupils as they proceed in their study, each one, besides reciting a lesson, should be required to give an analysis of a plant; sometimes the whole class having but one species, sometimes giving to each pupil permission to bring any flower she chooses. This, also, at public examinations, is a satisfactory method of testing their knowledge of the subject. With respect to those portions of the work to which their attention should most particularly be paid, it must be left to the judgment of the teacher. Whatever relates to modes of classification, and makes part of a system, should be noted; many remarks, illustrations, and quotations, are designed merely for reading, without being considered as important matter for recitations.

An analysis of the subjects of each Lecture is given, as a substitute for questions; the practice of having set questions, appearing too mechanical for teachers, who feel the spirit of the sciences they teach. This analysis, it is thought, will answer all the important purposes of questions, without being attended with their disadvantages.

INTRODUCTION.

LECTURE I.

Importance of System.—Advantages to be derived from the Study of Botany.

THE universe consists of *matter* and *mind*. By the faculties of mind with which God has endowed us, we are able to examine into the properties of the material objects by which we are surrounded.

If we had no sciences, nature would present exactly the same phenomena as at present. The heavenly bodies would move with equal regularity, and preserve the same relative situations, although no system of Astronomy had been formed. The laws of gravity and of motion, would operate in the same manner as at present, if we had no such science as Natural Philosophy. The affinities of substances for each other remain now as they were before the science of Chemistry existed. It is an important truth, and one which cannot be too much impressed upon the mind, in all scientific investigations, that no systems of man can change the laws and operations of Nature; though by systems we are enabled to gain a knowledge of these laws and relations.

The Deity has not only placed before us an almost infinite variety of objects, but has given to our minds the power of reducing them into classes, so as to form beautiful and regular systems, by which we can comprehend, under a few terms, this vast number of individual things, which, without system, would present to our bewildered minds a confused and indiscriminate mass. This power of the mind, so important in classification, is that of discovering resemblances. We perceive two objects, we have an idea of their resemblance, and we give a common name to both; other similar objects are then referred to the same class, or receive the same name. A child sees a flower which he is told is a rose; he sees another resembling it, and

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By the faculties of the mind we explain the properties of matter.—Human science cannot alter the laws of nature.—Power of the mind to form classes.

nature teaches him to call that also a rose. On this operation of the mind depends the power of forming classes.

Some relations or resemblances are seen at the first glance; others are not discovered until after close examination and reflection; but the most perfect classification is not always founded upon the most obvious resemblances: for example, a person ignorant of Botany, on beholding the profusion of flowers which adorn the face of nature, would discover general resemblances, and perhaps form in his mind, some order of arrangement; but the system of Botany now in use, neglecting the most conspicuous parts of the flower, is founded upon the observation of small parts of it, which a common observer might not notice.

System is necessary in every science. It not only assists in the acquisition of knowledge, but enables us to retain what is thus acquired; and, by the laws of association, to call forth what is treasured up in the storehouse of the mind. System is important not only in the grave and elevated departments of science, but is essential in the most common concerns and operations of ordinary life. In conducting any kind of business, and in the arrangement of household concerns, it is indispensable to the success of the one, and to the comfort of those interested in the other. The very logical and systematic arrangement which prevails in Botanical science, has, without doubt, a tendency to induce in the mind the habit and love of order; which, when once established, will operate, even in the minutest concerns. Whoever traces this system, through its various connexions, by a gradual progress from individual plants to general classes, until the whole vegetable world seems brought into one point of view; and then descends in the same methodical manner, from generals to particulars, must acquire a habit of arrangement, and a perception of order, which is the true practical logic.

The study of Botany seems peculiarly adapted to females; the objects of its investigation are beautiful and delicate; its pursuits leading to exercise in the open air are conducive to health and cheerfulness. It is not a sedentary study which can be acquired in the library, but the objects of the science are scattered over the surface of the earth, along the banks of the winding brooks, on the borders of precipices, the sides of mountains, and the depths of the forest.

A knowledge of Botany is indispensable to the medical profession. Our Almighty Benefactor, in bestowing upon us the

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Classification not always founded upon the most striking resemblances, as in Botany.—Importance of system.—The study of Botany is practical logic.—Proper for females.—Adapted to the medical profession.

vegetable tribes, has not only provided a source of refined enjoyment in the contemplation of their beautiful forms and colours; in their fragrance, by which, in their peculiar language, they seem to hold secret communion with our minds; he has not only given them for our food and clothing, but with kind, parental care, has, in them, provided powers to counteract and remove the diseases to which mankind are subject. For many ages plants were the only medicines known, or used; but modern discoveries in Chemistry, by forming compounds of previously existing elements, have in some degree, superseded their use. Although the science of medicine has received much additional light from Chemistry, it may perhaps in modern days have occupied the attention of medical men too exclusively; inducing them to toil in their laboratories, in order to form those combinations which nature had executed much more perfectly, in the plants which they pass unheeded. It is said by an eminent physician, that in the catalogues of the most useful medicines, the productions of the animal and mineral kingdoms, bear but a small proportion to the vegetable. It is perhaps no uncommon idea, with the generality of people, that herbs are all somewhat alike in their properties, and that it is not very important what species they use in particular cases, since, if they do no good, they will do no hurt. This is an error from which much evil has resulted; health and life have been sacrificed through its influence.

When our forefathers came to this country, they found the natives in possession of much medical knowledge of plants. Having no remedies prepared by scientific skill, the Indians were led, by necessity, to the use of those which nature offered them; and, by experience and observation, they had arrived at many valuable conclusions as to the qualities of plants. Their mode of life leading them to penetrate the shades of the forest, to climb the mountain precipices, naturally associated them much with the vegetable world. The Indian woman, the patient sharer in these excursions, urged by a mother's affection, was led to look for such plants as she might use for the diseases of her children. Each new and curious plant, though not viewed by her as a botanist would now behold it, doubtless was regarded with scrutinizing attention; the colour, the taste, the smell, were carefully remarked as indications of its properties. But the discoveries and observations of the Indians have perished with themselves; having no system for the classification or description of plants, nor any written language by which such a system might have been conveyed to others, no vestige but un-

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Experience of the Indians with respect to plants, lost from their ignorance of Botany.

certain tradition remains of their valuable knowledge of the medicinal qualities of plants.

The study of nature in any of her varieties is highly interesting and useful. But the *heavenly bodies* are far distant from us, and were they within our reach, are too mighty for us to grasp; our feeble minds seem almost overwhelmed in the contemplation of their immensity. *Animals* though affording the most striking marks of designing wisdom, as seen even in the structure of the minutest insect, cannot be dissected and examined without painful and unpleasant sensations. The *vegetable world* offers a boundless field of inquiry, which may be explored with none but the most pure and delightful emotions. Here the Almighty seems to manifest himself to us with less of that dazzling sublimity which it is almost painful to behold in his more magnificent creations; and it might almost appear that accommodating the vegetable world in some degree to our capacities, he had especially designed it for our investigation and amusement.

The study of Botany naturally leads to a greater love and reverence for the Deity. We would not affirm that it does in reality always produce this effect; for unhappily there are some minds which though quick to perceive the beauties of nature, seem blindly to overlook Him who spread them forth. They can admire the gifts, while they forget the Giver. But those who feel in their hearts a love to God, and who see in the natural world the workings of his power, can look abroad, and adopting the language of a christian poet, exclaim,

> "My Father made them all."

DIVISION OF THE SUBJECT.

Having endeavoured to convince you that the study you are about to commence, is recommended by its own intrinsic utility, and especially by its tendency to strengthen the understanding and improve the heart, we will now proceed to lay before you the arrangement which we propose to follow in our course of instruction.

We will divide our course of study into *Four Parts*, viz.:

Part I. Will be chiefly devoted to the *Analysis* of *Plants*, or lessons in *Practical Botany*.

Study of the vegetable world peculiarly pleasing.—The study of Botany tends to piety.—Division of the subject into *four parts*.—1. Practical Botany.

Part II. We shall here consider the various organs of the plant, beginning with the root and ascending to the flower; this part will include what is usually termed Elementary Botany; it will also contain remarks upon the uses of the various organs of plants, the Nature of vegetable substances, the Anatomy of plants, and other circumstances connected with vegetable Physiology.

Part III. In this part we shall consider the different *systems of Botany.* We shall examine some of the most important, *Natural Families*; and then proceed to give a detailed view of the *Linnæan System*; remarking upon some of the most interesting plants, and natural families found under each class, and order.

Part IV. In this part we shall consider the Progressive appearance of Flowers during the season of blossoming; their various phenomena produced by the *different states* of the atmosphere, light, &c.; their distribution over the face of the earth, and the effect of elevation as similar to that of distance from the equator. After giving a History of Botany, we shall take a general view of Nature; the distinction between organized and inorganized matter; the classification of Animals, with the analogies, and differences presented by a view of the animal and vegetable kingdoms.

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2. Vegetable Physiology.—3. Systematic Botany.—4. Various phenomena of plants, History of Botany, and General views of Nature.

PART I.

LECTURE II.

General division of the sciences which relate to mind and matter—Different departments of Botanical Science—Of the parts of a flower.

THE Universe, as composed of *mind* and *matter*, gives rise to various sciences. The SUPREME BEING we believe to be *immaterial*, or *pure mind.*

The knowledge of *mind* may be considered under *two general heads.*

1. THEOLOGY, or that science which comprehends our views of the Deity, and our duties to Him.

2. PHILOSOPHY OF THE HUMAN MIND, or, *metaphysics*, which is the science that investigates the mind of man, and analyzes and arranges its faculties.

The knowledge of *matter*, which is included under the general term, *Physics*, may be considered under *three general heads.*

1. NATURAL PHILOSOPHY, which considers the effects of bodies acting upon each other by their mechanical powers; as their weight and motion.

2. CHEMISTRY, in which the properties, and mutual action of the elementary atoms of bodies are investigated.

3. NATURAL HISTORY, which considers the external forms and characters of objects, and arranges them in classes.

NATURAL HISTORY is divided into *three branches.*

1. ZOOLOGY, which treats of animals.

2. BOTANY, which treats of plants.

3. MINERALOGY, which treats of the inorganized masses of the globe; as stones, earths, &c., GEOLOGY, which treats of minerals as they exist in masses forming rocks, is a branch of mineralogy.

Having thus presented you with this general view of the

Divisions of the sciences which relate to mind.—Those which relate to matter.—Branches of Natural History.

sciences, we will now proceed to that department which is to be the object of your present study.

DEPARTMENTS IN BOTANY.

Botany,* that department of Natural History which we are now to investigate, treats of the vegetable kingdom, including every thing which *grows, having root, stem, leaf, or flower.* This science comprehends the knowledge of the methodical arrangement of plants, of their structure, and whatever has relation to the vegetable kingdom. The study of plants may be considered under two general heads.

1st. The classification of plants by means of comparing their different organs, is termed *Systematic Botany.*

2nd. The knowledge of the relations and uses of the various parts of plants with respect to each other, is termed *Physiological Botany.* This department includes Vegetable Anatomy.

Systematic Botany is divided into the *artificial* and *natural methods.* The artificial method is founded upon different circumstances of two organs of the plant, called the *pistils* and *stamens.* Linnæus of Sweden was the first who discovered that these organs are common to all plants, and essential to their existence. Taking advantage of this fact, he founded his classes and orders upon their number, situation, and proportion. By this artificial system, plants are brought together which are unlike in their general appearance, as in a dictionary, words of different signification are placed together from the mere circumstance of their agreeing in their initial letters.

PARTS OF THE FLOWER.

Before you can learn the principles on which the classification of plants depends, it is necessary that you should become acquainted with the parts of a *flower.* You have here a drawing which represents two very common flowers, a Lily and a Pink. You can, by comparing with these drawings, the descriptions about to be given, acquire a knowledge of the parts of a flower; and the farther to assist you, the flowers are dissected, that is, the different organs are drawn separately. Yet When you can procure natural flowers, they should always be examined in preference to any artificial representations.

You all know what the flower blossom is, and call each part

* From a Greek word, signifying an herb.

Departments in Botany—Definition of Botany—Systematic Botany—Parts of the flower.

of it a flower leaf; but in the language of botany, the pieces which you call flower leaves, are the *Petals*, and all the petals together are called the *Corolla.*

By examining the lily you will observe within the corolla six thread-like organs; these are called *Stamens.* Each stamen is composed of two parts, one long and slender, called the *Filament;* the other part called the *Anther*, is a kind of knob, like a little box, which when the flower comes to maturity, opens, and throws out a coloured dust, called the *Pollen.*

The central organ is called the *Pistil;* this consists of three parts, the top, which is called the *Stigma*, the slender filament which bears the stigma is called the *Style*, and the base is called the *Germ.*

In many flowers the corolla is surrounded by a kind of cup called the *Calyx*, this is wanting in the Lily, but exists in the Pink.

The *Receptacle*, is the end of the stem where all the other parts of the flower are inserted.

The Germ, as it advances to maturity is termed the *Pericarp*, and in this is contained the seed.

These 7 parts constitute what are called the organs of Fructification,* viz.

Calyx,	the cup.	*Pericarp*,	containing the seed.
Corolla,	blossom.	*Seed*,	rudiment of a new plant.
Stamens,	organs within the corolla.	*Receptacle*,	top of the stem.
Pistil,	central organ.		

We have now examined each part of a flower; this is one kind of analysis, or separation, but there is another kind of analysis with which you are now to be made acquainted, viz. that which we employ in finding out the Botanical name of a plant.

DIVISION OF PLANTS INTO CLASSES, &C.

According to the system now most used by botanists, plants are divided into *twenty one classes.* Each class is divided into Orders, the Orders into Genera,† and the Genera into Species. The name of the *Genus* is like a family name or surname; the

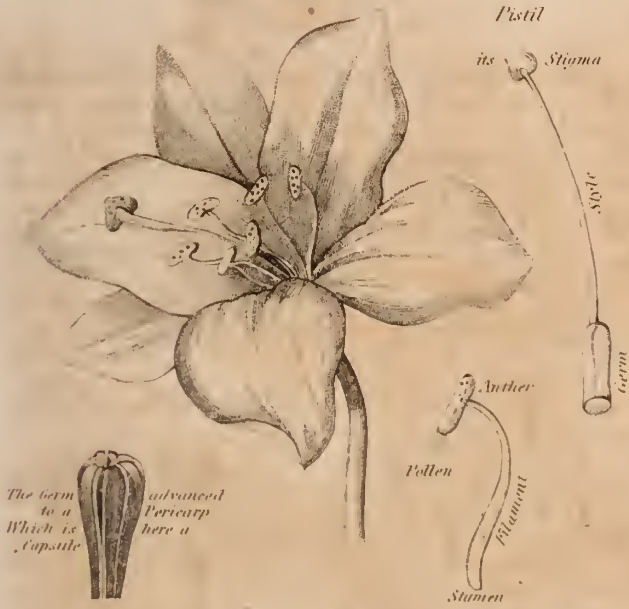
* From *fructus* fruit and *facio* to make, signifying that those parts serve to the maturing of the fruit.

† Plural of Genus, a family or tribe.

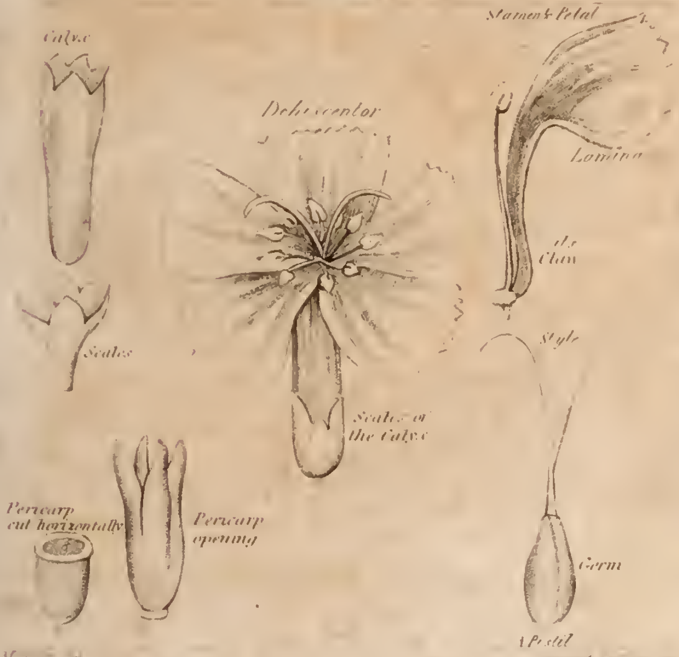
Petals—Corolla—Stamens—Parts of the stamens—Pistil—parts of the pistil—Calyx—Receptacle—Pericarp—Seed—Number of Classes—Genus—Species.

THE LILY

PLATE II.



PINK



name of the *species* is like the particular or christian name: for example; the Rose family contains many different kinds; as *Rosa alba*, the white rose, *Rosa damascena*, the damask rose, &c.

The specific or individual name in botany, is placed after the family name, as Rosa *alba*, which is Rose white, instead of White rose: this circumstance is probably owing to the names being in Latin; as in that language the adjective is generally placed after the noun instead of before it as in English.

LECTURE III.

Method of analyzing plants.—Analysis of the Pink, Lily, Rose, and Poppy.

When you begin to analyze plants, you will meet with many terms the use of which you do not understand. It will be necessary, in these cases to resort to the vocabulary of botanical words; by the observation of plants, connected with definitions, you will soon become familiar with the technical terms of Botany.

We will now proceed to analyze a flower in order to ascertain its botanical name. We will commence with the Pink, as you are provided with a drawing which you can examine if you have no natural flower.*

Analysis of the Pink.

In the first place we must find the class. We will suppose it to belong to one of the first ten classes; in this case all you have to do is to ascertain the number of stamens, as by this circumstance only all these classes are arranged.

You find *ten* stamens, therefore the Pink is in the 10th class, the name of which is *Decandria*. Having now ascertained its class, the next step is to find its *order*. In the first 12 classes, the orders depend on the number of pistils, you must then count the pistils. You find *two*, therefore your flower is of the 2nd order, the name of which is Digynia.

You must now turn to the description of the Genera of plants, find class 10, order 2d.

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* In analyzing a natural flower, it is necessary to separate the parts; first, if there is a calyx, remove it carefully, then take off the corolla, or if it is monopetalous, cut it open with a knife. A microscope is necessary if the organs are very small.

First step in the analysis of the Pink—second step.

You have next to compare your plant with each genus, until you find it described. You find first,

"HYDRANGEA. *Calyx* 5 *toothed*, *superior*;" your calyx is 5 toothed, (see the notches around the top of it,) but it is not *superior*, that is, it does not stand upon the germ. You must go to the next genus.

"SAXIFRAGA. *Calyx* 5 *parted*, *half superior*," but your calyx is not half superior, or partly above the germ. You must go to the next genus.

"SAPONARIA. *Calyx inferior*, (under the germ;) 1 *leafed*, (all of one piece;) *tubular*, (long and hollow like a tube;) 5 *toothed*,"—so far the description agrees with the Pink; next, "*calyx without scales.*" In this particular your flower does not correspond with the description, therefore you must go to the next genus.

DIANTHUS. *Calyx inferior*, *cylindrical*, (much the same as tubular;) 1 *leafed*, *with four or eight scales at the base; petals five*, *with claws*, (long and slender at the base;) *capsule cylindrical*, 1 *celled*, (having no partings;) *dehiscent*, (opening at the top.) Your flower agrees exactly with every particular in this description, therefore you may be certain that you have found the true generic or family name of the Pink, which is DIANTHUS.

But there are several individuals or species in this family. You wish to know to what species of Dianthus the Pink belongs.

Specific description.

Turn to the *Alphabetical Arrangement of Genera*, where the species of each Genus are described, and look for Dianthus. Now compare the description of each species with your flower; "*armeria*, *flowers aggregate*," (in a thick cluster;) this does not agree; you must look further; *barbatus*, "*flowers fascicled*," (crowded together) but your flower grows singly on each stalk; "*caryophyllus*, *flowers solitary*, *scales of the calyx sub*—(partly)—*rhomboid*, (diamond shape;) *very short*, *petals crenate*, (scolloped on the edge;) *beardless*, (without any hair or down.)

Your flower, you will see, is in all respects answerable to this description. It is also added that the "leaves are *linear*," which signifies long, and of nearly equal width; "*subulate*" signifies pointed at the end like a shoemaker's awl; "*channelled*" signifies having a groove or channel running through the leaf. Although your drawing gives only a representation of the flower,

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third step—fourth step.

you no doubt are so familiar with the leaves of the Pink, that you will recognize the description as correct.

You have now found the name of your plant to be DIANTHUS *caryophyllus.*

Class 10, DECANDRIA. Order 2d, DIGYNIA.*

And in this way it should be labelled for an *herbarium* or collection of dried plants.

You can now proceed with the analysis of any plant which belongs to the first ten classes, in the same manner as you have done with the Pink; as all these classes depend upon the circumstance of the number of stamens.

ANALYSIS OF THE LILY.

The Lily you will find to be of the 6th class, the name of which is HEXANDRIA, and 1st order, MONOGYNIA. This order containing a great many genera, is divided into several sections. The first, containing flowers "*with a perianth*," (that is, a kind of calyx,) and "*corolla without a spatha*," (a kind of wrapper.)

The Lily has no calyx, therefore you will not find it in this section.

2nd. Section. "*With a spatha or glume*, (a kind of sheath,) *without a perianth.*"

The Lily has no spatha or glume, therefore it is not in this section.

3d. Section. "*Flowers having no calyx.*"

The Lily has *no calyx*, therefore you may expect to find it described under this section. You can proceed, as in the Pink, to compare each genus with your flower, till you find a description which corresponds with the Lily.

"HEMEROCALLIS. *Corrolla six parted.*" Six parted shows that the corolla is all of one piece, having divisions around the border. The Lily is not six parted, but has six petals, therefore you need look no farther in this genus.

"LILIUM." Now compare each particular in this description with your flower, looking out the terms in the vocabulary, and you will find it to agree in every respect.

You will observe that in the description of a genus, nothing is said about any part of the plant, except the different organs

* The Student can consult the synopsis of artificial classes and orders to ascertain the etymology of their names; the whole system has not been introduced before, because it is thought better to lead the mind, by gradual induction, to generalize for itself.

Analysis of the Lily—parts of the plant chiefly referred to in describing the genus—

which compose the flower; in the species, the distinctions are chiefly drawn from different circumstances of the leaves, stems, &c.

The flowers of two plants may agree so as to belong to the same genus, while the leaves, stalks, and branches are very unlike, and the plants are therefore considered as of different species.

Thus, in the genus Lilium, the shape of the leaves, the manner in which they grow on the stem, the height of the stem, the number of flowers growing upon a stem, the manner in which they grow, whether erect or nodding, and the shape of the corolla; all these, and some other circumstances distinguish the different species. The colour, which is a quality of the flower usually the most striking, is, in botany, little regarded, while many other circumstances, which might at first have been scarcely noticed, are considered as important.

In the 11th class, Icosandria, and the 12th class, Polyandria, we are to remark, not only the number of stamens, which is always more than ten; but the manner in which they *are inserted*, or the part of the flower on which they are situated. If in pulling off the corolla, the stamens remain upon the calyx, the plant belongs to the eleventh class; but if the corolla and calyx may be both removed, and the stamens still remain on the receptacle, the plant is of the 12th class.

It is said that no poisonous plant has the stamens growing on the calyx, but it is in this class that we find many of our most delicious fruits as the Apple, Pear, &c.

Analysis of the Rose.

The Rose, on account of its beauty, is one of the most conspicuous flowers in this class, indeed it is considered as one of the most interesting of the vegetable race, and is often dignified with the title of "queen of flowers."

You will at once perceive on examining the formation of the Rose, with a view to learn its class, that its numerous stamens are attached to the calyx. A more perfect idea of their situation may be obtained by removing the petals and cutting the calyx longitudinally. Therefore, because it has more than ten stamens growing upon the calyx, it belongs to the 11th class, Icosandria. The pistils being more than ten, it is of the 13th order, Polygynia. It belongs to the first genus described under this order, Rosa.

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in the species.—New circumstances to be considered in the 11th and 12th classes. Analysis of the Rose—why is it in the 11th class?—why the 13th order?—

The shape of the calyx is "*urnform*," the calyx is "*inferior*," or below the germ; it is "*five cleft*," or has five divisions around the border; "*it is fleshy*," or thick and pulpy, "*contracted* towards the top;" "*petals* 5," (this is always the case with a rose in its natural state, unassisted by cultivation;) "*seeds numerous, bristly, fixed to the sides of the calyx within*."

There is no seed vessel, or pericarp to the rose; but the calyx itself swells into a berry which is red when ripe. The apple is formed in the same manner, you can at any time at the end of an apple opposite the stem, observe the divisions of the top of the calyx.

The genus Rosa contains many species, distinguished one from another by the different shape of the germ, the smoothness or roughness of the stems, the presence or absence of thorns, the shape of the leaves, and the manner in which the flowers grow upon the stalks, whether solitary or crowded together, in pairs, or scattered, whether erect or drooping.

The Moss rose, Rosa *muscosa*, is distinctly marked by the hairs, resembling moss, which cover the stems of the calyx; these hairs are a collection of glands containing a resinous and fragrant fluid.

Analysis of the Poppy.

The Poppy affords a good illustration of the 12th class, Polyandria; here are numerous stamens, always *more than ten*, sometimes more than a hundred, growing upon the receptacle; the Poppy has but one pistil, and therefore belongs to the first order, Monogynia; the genus is Papaver; it has a "*calyx of two leaves*," but these fall off as soon as the blossom expands, and are therefore called "*caducous;*" corolla (except when double) "*is four petaled;*" it has no style, but the stigma is set upon the germ, and is therefore said to be *sessile*.

The germ is large and somewhat oblong, the stigma is flat and radiated. The pericarp is one-celled or without divisions, it opens at the top, by pores, when the seeds are ripe.

The species of Papaver which is cultivated in gardens, is the *somniferum*, which name signifies to produce sleep. It is often called Opium Poppy. By observing the figures which stand at the right hand of the Papaver in the generic description, you will find to what natural order the plant belongs. The number 27 points to the natural families of Linnæus; this is the Rhæadæa, which includes plants with capsules and caducous calyxes. Such plants, as to medicinal properties, are *anodyne* (causing sleep,) and *antiscorbutic* (curing eruptions.)

Different species of the genus Rosa—Analysis of the Poppy. Natural order, how pointed out?—

The number 62 points to Papaveraceæ among the natural families of Jussieu, *Pavaveraceæ.* You cannot at present exactly understand what is meant by natural families, but when you have become familiar with the analysis, and different parts of plants, with their uses, we will give an explanation of them, and of the principles by which they are arranged.

In the commencement of a new science, it is not to be expected that every idea, or principle of arrangement will seem perfectly clear, as they may often relate to other principles not yet explained. In architecture, we know it would be impossible to form a clear idea of the use or beauty of a particular part of an edifice, until it was considered in its relation to the whole. The beginner in any branch of scientific knowledge, is not like one travelling a straight road, where every step is so much ground actually gained; but the views which he takes are like the faint sketches of a painter, which gradually brighten and grow more definite as he advances.

The idea which was formerly entertained, that students must learn perfectly every thing as they proceed, appears to be founded upon a wrong view both of the nature of the mind, and of the sciences. If to repeat words were the only object in learning, the rule might be a good one; but words are only valuable as instruments of conveying knowledge to the mind; and if, occasionally, after careful attention to the subject, something in your lessons may appear obscure, you need not attribute the difficulty to the dulness of your own faculties; it may arise from want of clearness in an author's style, or the subject may be connected with something which is to follow; therefore, you should patiently proceed, with the hope and expectation that difficulties will gradually disappear.

We shall not at present give any more examples of analyzing plants. With even the little practice you have now had, you can analyze flowers of any of the thirteen first classes; but it is necessary for you to know before proceeding farther, that the two circumstances of the *number* and *insertion* of the stamens, are not all that you are to take into consideration, in the arrangement of the classes; this was not sooner observed, that your minds might not be confused at first with too many new ideas.

You are now prepared to comprehend the general features of the Linnæan system, and to study the whole of the classes and orders in a connected view. Before proceeding to this, it seems necessary that you should have some knowledge of Greek

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Remarks respecting the commencement of a new study—

and Latin numerals. In our next lecture we shall commence, by this necessary preparation for comprehending the meaning of the names of classes and orders; and shall then explain their characters, and illustrate the same by drawings. Sensible objects are of great assistance to the mind, by enabling it to form definite ideas of the meaning of words. In most abstract studies we cannot have such aid; and in order to comprehend instructions given upon them it is necessary that the meanings of words should be well understood. Young people, and indeed sometimes those who are not very young, seem to think a general idea of the meaning of abstract terms, is sufficient: thus they speak of "a *sensation* of pity," when they mean an emotion. A more critical knowledge of the meaning of words, would enable them to perceive, that *sensation* is a term appropriated to that state of the mind which immediately follows the presence of an external object: it depends on the connexion between the body and the mind. The mind separated from all the organs of sense, could have no sensation; but it could have *emotions*, for they are feelings which the mind has, independently of the senses.

The great advantage of pursuing studies which relate to material objects, is, as we have before remarked, in being able to illustrate principles, and define terms by a reference to those objects or to delineations of them.

LECTURE IV.

Latin and Greek numerals.—Artificial classes and orders.

We shall now present you with a list of Latin and Greek numerals, which it is necessary to commit to memory, in order that you may understand the names given to the classes and orders. It is not in Botany alone, that a knowledge of these numerals will be useful to you; very many words in our common language are compounded with them; for example—*uniform*, from *unus*, one, and *forma*, form; *octagon*, a figure having *eight corners; hexagon*, having *six corners; pentagon*, having *five corners; decimal*, from *decem*, ten. These very few examples may show you the importance of knowing these numer-

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Assistance which the mind derives from sensible objects—Example of using terms indefinitely. Importance of understanding Latin and Greek numerals.

als; they will serve as a key to the meaning of words, which otherwise you might be obliged to look out in a dictionary.

NUMERALS.

Latin.	*Numbers.*	*Greek.*	
Unus.	1.	Monos.	single.
Bis.	2.	Dis.	twice.
Tres.	3.	Treis.	thrice.
Quatuor.	4.	Tettares	
Quinque.	5.	Pente.	
Sex.	6.	Hex.	
Septem.	7.	Hepta.	
Octo.	8.	Okto.	
Novem.	9.	Ennea.	
Decem.	10.	Deka.	
Undecem.	11.	Endeka.	
Duodecem.	12.	Dodeka.	
Tredecem.	13.	Dekatreis.	
Quatuordecem.	14.	Dekatettares.	
Quindecem.	15.	Dekapente.	
Sexdecem.	16.	Dekaex.	
Septendecem.	17.	Dekaepta.	
Octodecem.	18.	Dekaokto.	
Novemdecem.	19.	Dekaennea.	
Viginti.	20.	Eikosi.	
Multus.	Many.	Polus.	

THE CLASSES OF LINNÆUS.

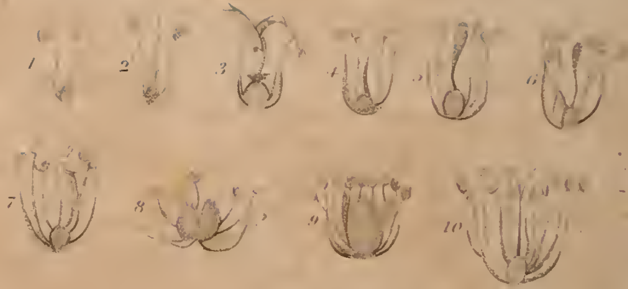
These are founded upon distinctions observed in the Stamens. According to this system, all known plants are divided into *twenty one classes.*

The first twelve classes are named by prefixing Greek numerals to andria, which signifies *stamen.*

Latin numerals—Greek numerals—Classes of Linnæus, on what founded. First twelve, how named.

CLASSES

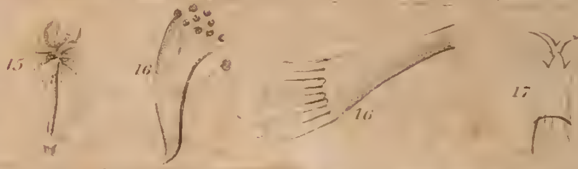
PLATE IX.



Number of Stamens

No. & Position

No. & Length



Connexion

Position

Lichens

Mushrooms

Ferns

Mosses

Natural

Mh. L. [illegible]

CLASSES.

	Names.	Definitions.
Number of Stamens	1. Mon-andria,	*One Stamen.*
	2. Di-andria,	*Two Stamens.*
	3. Tri-andria,	*Three Stamens.*
	4. Tetr-andria,	*Four Stamens.*
	5. Pent-andria,	*Five Stamens.*
	6. Hex-andria,	*Six Stamens.*
	7. Hept-andria,	*Seven Stamens..*
	8. Oct-andria,	*Eight Stamens.*
	9. Enne-andria,	*Nine Stamens.*
	10. Dec-andria,	*Ten Stamens.*
Number and position.	11. Icos-andria,* (Eikosi.) 20	*Over ten Stamens inserted on the Calyx.*
	12. Poly-andria, (Polus.) many.	*Many Stamens inserted on the Receptacle.*

The two following classes are named by prefixing Greek numerals to DYNAMIA, which signifies *power* or length.

Number and relative length.	13. Di-dynamia,	*Two Stamens longer or more powerful than the other two.*
	14. Tetra-dynamia,	*Four Stamens longer or more powerful than the other two.*

The two following classes are named by prefixing Greek unmerals, to the word ADELPHIA, which signifies *brotherhood.*

Connexion.	15. Mon-adelphia,	*Stamens united by their filaments in one set or brotherhood.*
	16. Di-adelphia.	*Two brotherhoods.*

The next class is named by prefixing SYN, signifying *together*, to GENESIA, which signifies *growing up.*

	17. Syn-genesia.	*Five united anthers, flowers compound.*

*The name of this class does not now designate its character, since the number of stamens is often more or less than twenty.

Depend on the number of stamens—those which depend on number and position—number and relative length—connexion.

The next class is named by an abbreviation of the world GYNIA which signifies pistil, prefixed to ANDRIA, showing that the stamens and pistil are united.

Position.	18. GYN-ANDRIA.	*Stamens growing out of the pistil.*

The two following classes are named by prefixing numerals to ŒCIA, which signifies a house.

	19. MON-ŒCIA.	*Stamens and Pistils on separate corollas upon the same plant, or in one house.*
	20. DI-ŒCIA.	*Stamens and Pistils, in separate corollas upon different plants or in two houses.*

The name of the last class is a compound of two Greek words CRYPTO and GAMIA, signifying a concealed union.

Natural.	21. CRYPTO-GAMIA.	*Stamens and Pistils invisible, or too small to be seen with the naked eye.*

The number of classes as arranged by Linnæus was twenty-four. Two of them Poly-adelphia, (many brotherhoods,) which was the eighteenth class, and Poly-gamia, (many unions,) the twenty-third class have, by late botanists, been rejected as unnecessary.

The eleventh class Dodecandria, which included plants whose flowers contain from twelve to twenty stamens, has been more recently omitted. The plants which belong to these have been distributed among the other classes.

A few botanists retain the whole twenty-four; among American writers who adopt but twenty-one, are Eaton, Torrey, and Nuttall.

Position.—Natural class.—Classes omitted.—

THE ORDERS OF LINNÆUS.

The orders of the first twelve classes are founded upon the number of styles,* or sessile stigmas.

The orders are named by prefixing Greek numerals to the word gynia, signifying pistil.

ORDERS.

	Names.	*No. of styles, or sessile stigmas.*
Orders found in the first twelve classes.	1. Mono-gynia,	1.
	2. Di-gynia,	2.
	3. Tri-gynia,	3.
	4. Tetra-gynia,	4.
	5. Penta-gynia,	5.
	6. Hexa-gynia,	6. *this order seldom found.*
	7. Hepta-gynia,	7. *this still more unusual.*
	8. Octo-gynia,	8. *very rare.*
	9. Ennea-cynia,	9. *very rare.*
	10. Deca-gynia,	10.
	13. Poly-gynia,	*over ten styles or sessile stigmas.*

The classes vary as to the number of orders which they contain.

The orders of the 13th class, Didynamia, are but two.

1. Gymnospermia. From gymno, signifying naked, and spermia, signifying seed, implying that the seeds are not covered.
seeds usually four lying in the calyx.

2. Angiospermia. From angio, signifying bag or sack, added to spermia, implying that the seeds are covered.
seeds numerous in a capsule.

The orders of the 14th class, Tetradynamia, are two, both distinguished by the form of the fruit.

1. Siliculosa. Fruit, a silicula, or *roundish* pod.
2. Siliquosa. Fruit, a siliqua, or *long* pod.

The orders of the 15th class, Monadelphia, and of the 16th class, Diadelphia, are founded on the number of stamens, that is, on the characters of the first twelve classes, and they have the same names, as Monandria, &c.

*Style often is used as synonymous, with pistil: it should be observed that when in a description, two or three pistils are mentioned it is not certain that there are not several germs; for one germ may be crowned with several styles or sessile stigmas, in which case the flower is said to have that number of pistils; although strictly speaking, with one germ there can be but one pistil.

Orders of the first twelve classes, on what founded, and how named? Orders of the class Didynamia—of the Tetradynamia—of the classes Monadelphia and Diadelphia.—

The 17th class, Syngenesia, has its five orders distinguished by different circumstances of its florets, as,

1. Equalis.* Stamens and pistils *equal*, or in proportion; that is, each floret has a *stamen*, a *pistil*, and one seed. Such florets are called *perfect.*
2. Superflua. Florets of the disk perfect, of the ray containing *only pistils*, which without stamens are *superfluous.*
3. Frustranea. Florets of the disk perfect, of the ray neutral, or without the stamen or pistil; therefore *frustrated*, or useless.
4. Necessaria. Florets of the disk staminate, of the ray pistillate; the latter being *necessary* to the perfection of the fruit.
5. Segregata. Florets separated from each other by partial calyxes, or each floret having a perianth.

The orders of the 18th class, Gynandria, of the 19 class, Monœeia, and the 20th class, Diœeia, like the 15th and 16th classes, depend on the number of stamens.

The orders of the 21st class, Cryptogamia, constitute six natural families.

1. Filices,—includes all *Ferns* having the fruit on the back of the leaves.
2. Musci,---Mosses.
3. Hepaticeae,---Liverworts, or succulent mosses.
4. Algae,---Sea-weeds, and frog spittle.
5. Lichenes,--Lichens, found growing on the barks of old trees, and on old wood.
6. Fungi,---Mushrooms, mould, blight, &c.

No confusion is produced in thus taking the character of some classes, for orders in other classes; for example: if you have a flower with ten stamens, united by their filaments into one set, you know by the definition of the classes that it belongs to the *class* Monadelphia, you can then, because it has ten stamens, place it in the *order*, Decandria.

Having in succession exhibited the artificial classes and orders, we will now place them both before you, in a synoptical or general view.

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* The term Polygamia is omitted on the authority of Nuttall

Of the class Syngenesia—Of the classes Gynandria, Monœcia and Diœcia—Of the class Cryptogamia.—

"SYNOPSIS OF THE CLASSES AND ORDERS OF LINNÆUS."

	Classes.	Orders.
Number of Stamens.	1. Monandria, 1 stamen. 2. Diandria, 2. 3. Triandria, 3. 4. Tetrandria, 4. 5 Pentandria, 5. 6. Hexandria, 6. 7. Heptandria, 7. 8. Octandria, 8. 9. Enneandria, 9. 10. Decandria, 10.	Number of styles; if styles are wanting, number of sessile stigmas. Monogynia, 1. style or one sessile stigma. Digynia 2. Trigynia, 3. Tetragynia, 4. Pentagynia, 5. Hexagynia, 6. Heptagynia, 7. Octogynia, 8. Enneagynia, 9. Decagynia, 10. Polygynia, any number over 10.
Number and Position.	11. Icosandria, over 10 stamens, on the calyx. 12. Polyandria, many stamens, not on the calyx.	
Number and relative Length.	13. Didynamia, 4 stamens 2 of them longest. 14. Tetradynamia, 6 stamens, 4 of them longest.	1. Gymnospermia, seeds naked. 2. Angiospermia, seeds in capsules. 1. Siliculosa, pod short. 2. Siliquosa, pod long.
Connexion of the Stamens by filaments or anthers.	15. Monandelphia, filaments united in 1 set. 16. Diadelphia, filaments united in 2 sets—papilionaceous. 17. Syngenesia, anthers united—flowers compound.	Characters and names of preceding classes. As, 1. Monandria, 2. Diandria, 3. Triandria, 4. Tetrandria, 5. Pentandria, 6. Hexandria. Disk and ray florets compared. 1. Æqualis, 2. Superflua, 3. Frustranea, 4. Necessaria, 5. Segregata.
Position of the Stamens relative to the Pistils.	18. Gynandria, stamens on the pistil, distant from corolla. 19. Monœcia, stamens in flowers separate from pistils, on the same plant. 20. Diœcia, stamens in flowers separate from pistils on separate plants	Characters and names of preceding classes, (as under the classes 15 and 16,) 7. Heptandria, 8. Octandria, 9. Enneandria, 10. Decandria, 12. Polyandria, 16. Monadelphia.
Invisible or Caducous.	21. Cryptogamia, stamens invisible, wanting, or very caducous.	Natural families. 1. Filices, 2. Musci, 3. Hepaticae, 4 Algæ, 5. Lichenes, 6. Fungi.

We have now in a condensed form, exhibited the Linnæan system; a thorough knowledge of it can only be gained by a series of inductions made by the analysis of single plants. You cannot be to much impressed with the idea, that a knowledge of nature must be acquired chiefly by the observation of material objects.

Synopsis of artificial classes and orders—

LECTURE V.

Condensed view of the Natural orders of Linnæus and Jussieu.

Often when you have analyzed a number of plants you will begin to observe a striking resemblance to each other in many genera, and your own minds would suggest the propriety of arranging them into groups, without any reference to the artificial class or order where they may have been placed. This is to form, what are called natural families.

Among resemblances which give rise to natural families; are,

1st, In seeds.
2d, In pericarps, or the envelopes of seeds.
3d, In stamens and pistils.
4th, In corollas and calyxes.
5th, In the modes of inflorescence, or the manner in which the flowers grow together upon the stalks.
6th, In leaves.
7th, In roots and stems.

In order to form a correct idea of the *natural methods* of classification, it is necessary to observe many plants, and the most constant characters of most of their organs. To find the place of plants in the artificial classes and orders, it is only necessary to observe the distinctions of the stamens and pistils.

You will recollect that *Natural Methods* depend on *many considerations;* the *Artificial System* is founded on a few *simple principles.*

But without attempting to explain to you the peculiarities of Natural Methods, we will now place before you those of Linnæus and of Jussieu, a French botanist. These you are to refer to, in your analysis of flowers, rather than to study them in regular order. The physician is chiefly conversant with the natural characters of plants, especially with such as are connected by medicinal qualities; he would say of such a group, this contains plants which are *narcotic;* of another, these are *tonics;* of another that they are *refrigerants,*[*] &c.

Yet though the natural method is of the greatest utility, its chief use depends on a knowledge of the artificial system, which enables us to find, in an expeditious manner, the name of the plant, and then its place among the natural families or orders.

Linnæus did not consider that his natural method could be used without the assistance of the artificial system; but he considered the former as ingrafted upon the latter.

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[*] In explanation of these terms, see *vocabulary.*

Arrangement of plants into natural families—Important resemblances which give rise to natural families—Difference between natural methods and the artificial system. The physician chiefly conversant with natural methods.—

ORDERS.

1. PALMÆ. Palms and their relatives; as Cocoanut, Frog's bit. *Farinaceous diet.*

2. PIPERITÆ. Pepper and its relatives. In crowded spikes; as Indian-turnip, sweet-flag. *Tonics and stomachics.*

3. CALAMARIÆ. Reed-like grasses, with culms without joints; as cat-tail, sedge. *Coarse cattle fodder.*

4. GRAMINA. The proper grasses with jointed culms; as Wheat, Rye, Oats,, Timothy-grass, Indian-corn. *Farinaceous diet, and cattle fodder.*

5. TRIPETALOIDEÆ. Corol* 3-petalled, or calyx 3leaved; as Water-plantain, Rush-grass, Arrow-head. *Tonics and rough cattle fodder.*

6. ENSATÆ. Liliaceous plants, with sword-form leaves; as Iris, Blue-eyed grass, Virginian spiderwort. *Antiscorbutics and tonics.*

7. ORCHIDEÆ. With fleshy roots, stamens on the pistils, pollen glutinous, flowers of singular structure with the germ inferior; as Ladies' slipper, Arethusa. *Farinaceous diet* and *stomachics.*

8. SCITAMINEÆ. Liliaceous corols, stems herbaceous, leaves broad, germen blunt-angular; as Ginger, Turmeric. *Warming stomachics.*

9. SPATHACEÆ. Liliacious plants with spathes;† as Daffodil, Onion, Snow-drop. *Secernant stimulants.*

10. CORONARIÆ. Liliaceous plants without spathes; as Lily, Tulip, Star-grass. The nauseous scented and bitter are *antiscorbutic* and *cathartic*, the others *Emollient.*

11. SARMENTACEÆ. Liliaceous corols with very weak stems; as Similax, Asparagus, Bell-wort. *Tonics* and *Secernant stimulants.*

12. OLERACEÆ or HOLERACEÆ. Having flowers destitute of beauty, at least of gay colouring; as Beet, Blight, Pig-weed, Dock, Pepperage. If nauseous, *Cathartic*; others, *mild stimulants* and *nutrientics.*

13. SUCCULENTÆ. Plants with very thick succulent leaves; as Prickly-pear, House-leek, Purslane. *Antiscorbutic* and *Emollient.*

14. GRUINALES. Corols with 'five petals, capsules beaked; as Flax, Wood-sorrel, Cranes-bill. *Tonics* and *Refrigerants.*

15. INUNDATAE. Growing under water, and having flowers destitute of beauty; as Hippuris, Pondweed. *Astringents.*

16. CALYCIFLORAE. Plants without corols, with the stamens on the calyx; as Poet's cassia, Seed buckthorn. *Astringents* and *Refrigerants.*

17. CALYCANTHEMAE. Calyx on the germ or growing to it, flowers beautiful; as Willow-herb, Ludwigia, Œnothera. *Astringents.*

18. BICORNES. Anthers with two straight horns; as Whortleberry, spicy and bitter Wintergreen, Laurel. *Astringents.*

19. HESPERIDES. Sweet-scented, leaves evergreen; as Myrtle, Cloves, Mock-orange. *Astringent* and *stomachic.*

20. ROTACEAE. Corols wheel-form; as Gentian, St. John's wort. *Tonics.*

21. PRECIAE. Plants with early spring flowers of an elegant, specious appearance; as Primrose. *Astringents.*

22. CARYOPHYLLEAE. Plants with caryophyllous corols; as Pink, Cockle, *Astringent* and *Secernant stimulants.*

23. TRIHILATAE. Flowers with 3 stigmas, capsules inflated and winged, and generally three-seeded with distinct hilums; as Nasturtion, Horse-chesnut. *Tonics* and *Nutrientics.*

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* Or corolla.

† Or spathas.

The artificial system an index to natural methods—Natural orders of Linnæus

24. Corydales. Corols spurred or anomalous; as Fumatory, Touch-me-not. *Narcotic* and *Antiscorbutic.*

25. Putaminae. Plants which bear shell-fruit; as Caperbush. *Detergent* and *Antiscorbutic.*

26. Multisiliquae. Having several pod-form capsules to each flower; as Columbine, Larkspur, Rue, American cowslip. *Cathartic* and *Caustic.*

27. Rhœadeae. Plants with caducous calyxes, and capsule or siliques; as Poppy, Blood-root, Celandine. *Anodyne* and *Antiscorbutic.*

28. Luridae. Corols lurid, mostly monopetalous; flowers Pentandrous, or Didynamous with capsules; as Tobacco, Thorn-apple, Night-shade, Foxglove. *Narcotic* and *Antiscorbutic.*

29. Campanaceae. Having bell-form corols, or those whose general aspect is somewhat bell-form; as Morning-glory, Bell-flower, Violet, Cardinal flower. *Cathartics* and *Secernant stimulants.*

30. Contortæ. Corols twisted or contorted; as Milk-weed, Periwinkle, Choak-dog. *Cathartics* and *Antiscorbutics.*

31. Vepreculæ. Having monophyllous calyxes, coloured like corols; as Leatherwood, Thesium. *Antiscorbutic* and *Emetic.*

32. Papilonaceæ. Having papilionaccous flowers; as Peas, Beans, Locust-tree, Clover. *Emollient, Nutrientic.*

33. Lomentaceæ. Having legumes or loments, but not perfect papilionaceous flowers; as Cassia, Sensitive plant. *Emollient, Astringent, Cathartic.*

34. Cucurbitaceæ. Fruit pompion-like, anthers mostly united; as Melons, Cucumbers, Passion-flower. *Cathartic* end *Refrigerant.*

35. Senticosæ. Prickly or hairy, with Polypetalous corols and a number of seeds either naked or slightly covered; as Rose, Raspberry, Strawberry. *Astringent* and *Refrigerant.*

36. Pomaceæ. Having many stamens on the calyx, and drupaceous or pomaceous fruit; as Pear, Currant, Cherry, Peach. *Refrigerants.*

37. Columniferæ. Stamens united in the form of a column; as Hollyhock, Mallows, Cotton. *Emollient.*

38. Tricoccæ. Having 3-celled capsules; as Castor-oil plant, Spurge, Box. *Cathartic.*

39. Siliquosæ. Having silique pods; as Cabbage, Mustard, Shepherd-purse. *Antiscorbutic, Nutrientic.*

40. Personatæ. Having personate corols; as Snapdragon, Monkey-flower. *Deobstruents,* and *Cathartics.*

41. Asperifoliæ. Corols monopetalous, with 5 stamens, seeds 4, naked, leaves rough; as Comfrey, Stone-seed, (lithospermum.) *Astringents* and *Deobstruents.*

42. Verticillatæ. Having Labiate flowers; as Sage, Thyme, Catmint, Motherwort. *Stomachics* and *Astringents.*

43. Dumosæ. Bushy pithy plants with small flowers, petals in 4 or 5 divisions; as Sumach, Elder, Holly. *Tonic* and *Cathartic.*

44. Sepiariæ. Having mostly tubular divided corols with few stamens; being ornamental shrubs; as Lilac, Jasmine. *Astringent.*

45. Umbellatæ. Flowers in umbels with 5-petalled corols, stamens 5, styles 2, and 2 naked seeds; as Fennel, Dill, Carrot, Poison-hemlock. *Stomachic* and *Narcotic.*

46. Hederaceæ. Corols 5-cleft, stamens 5 to 10, fruit berry-like on a compound raceme; as Grape, Ginseng, Spikenard. *Tonics* and *Refrigerants.*

47. Stellatæ. Corols 4-cleft, stamens 4, seeds 2, naked, leaves mostly whorled; as Bedstraw, Dogwood, Venus' pride. *Tonics* and *Deobstruents.*

48. Aggregatæ. Having aggregate flowers; as Button-bush, Marsh-rosemary. *Tonics* and *Secernant stimulants.*

49. Composite. All the compound flowers; as Sun-flower, Boneset, Tansey, Thistle. *Tonics* and *Secernant stimulants.*

50. Amentaceæ. Bearing pendent aments; as Hazle, Oak, Chesnut, Willow. *Astringents.*

51. Coniferæ. Bearing strobiles; as Pine, Juniper, Cedar. *Tonics* and *Stomachics.*

52. Coadunatæ. Several berry-like pericarps, which are adnate; as Tulip-tree, Magnolia. *Tonics.*

53. Scabridæ. Leaves rough, flowers destitute of beauty; as Nettle, Hemp, Hop, Elm. *Astringents.*

54. Miscellaneae. Plants not arranged by any particular character; as Pond-lily, Poke-weed, Amaranth. Their qualities are *various.*

55. Filices. All ferns; as Brakes, Maiden-hair. *Secernant stimulants.*

56. Musci. All mosses; as Polytrichum. *Cathartics* and *Secernant stimulants.*

57. Algae. All Liverworts, Lichens and Sea-weeds; as Jungermannia, Fucus, Usnea. *Tonics.*

58. Fungi. All funguses; as Mushroom, Toad-stool, Puff-ball, Touchwood, Mould. *Tonics* and *Cathartics.*"*

General divisions of Jussieu.

The natural orders of Jussieu are arranged under three general divisions, according to distinctions observed in the seed; viz. *Acotyledonous,*† *Monocotyledonous*†, *and Dicotyledonous*† plants.

The Acotyledonous plants correspond to the class Cryptogamia of the artificial system.

MONOCOTYLEDONS.

The Monocotyledonous plants are divided into three classes characterised by the insertion of the stamens; 1st has the stamens *hypogynous* ,or *under* the pistil; as the grasses, &c. 2d has the stamens *perigynous*, or *around* the pistil; as the palms, &c. 3d has the stamens *epigynous*, or *upon* the pistil; as the orchis, &c.

DICOTYLEDONS.

The Dicotyledonous plants are ten times more numerous than the two preceding divisions; the different classes are here arranged as in the other cases with reference to the absence of the corolla.its presence, and the number of its petals. These plants are divided into four sections.

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[*] The preceding synopsis of artificial classes and orders, together with the natural orders of Linnæus, are quoted from Eaton, by permission.

[†] See these terms in the vocabulary.

Three general divisions of plants by Jussieu—Acotyledonous, Monocotyledonous, how divided, Dicotyledonous, how divided.—

The first section, *Apetalous* (wanting petals) is divided into three classes.

1st, Comprehends all dicotyledonous plants destitute of a corolla, which have the stamens *epigynous* ; as wild ginger.
2d, Comprehends all dicotyledonous plants destitute of a corolla, which have the stamens *perigynous ;* as dock, &c.
3d, Comprehends all dicotyledonous plants, destitute of corolla, which have the stamens *hypogynous ;* as plantain, &c.

The second section *monopetalous* is divided into four classes.

1st, Comprehends all dicotyledonous, monopetalous plants, which have the stamens *hypogynous ;* as milkweed, &c.
2d, Differs from the first only in having the stamens *perigynous ;* as, the wintergreen, &c.
3d, Differs from the two preceding, in having stamens *epigynous*, and anthers united ; as, lettuce, &c.
4th, Differs from the third only in having the anthers separate ; as, the elder, &c.

The third section, *Polypetalous*, is divided into three classes.

1st, Stamens *epigynous :* as, umbellate flowers.
2d, Stamens *hypogynous ;* as cruciform flowers.
3d, Stamens *perigynous ;* as, the rose, &c.

The fourth section *anamalous*, contains the 15th and last class of the method of Jussieu.

This class contains the melon, hop, oak, &c. It corresponds to the classes Monoecia and Dioecia of Linnæus.

These fifteen classes are divided into 100 families or orders as they are sometimes termed ; but the word *order*, being appropriated to the artificial system, that of *family* seems more properly applied in this case.

NATURAL FAMILIES OF JUSSIEU.

ACOTYLEDONOUS PLANTS.

Class I.

Names.	*Examples.*	*Properties.*
1. Fungi.	Mushroom, mould	*Tonic* if dry, *narcotic* if juicy.
2. Algae.	Lichen, conferva.	*Tonic* some used in *dyeing.*
3. Hepaticae.	Brook liverwort.	*Tonic, refrigerant.*
4. Musci.	Proper mosses.	*Tonic*, rarely cathartic.
5. Filices.	Brakes, polypod.	*Secernant stimulants.*
6. Naiades.	Duck meat.	*Astringent.*

First section, into how many classes divided—Second section, how divided—Third section—Fourth section—Jussieu's fifteen classes, into how many families divided—Natural families of Jussieu.—Class 1.

MONOCOTYLEDONOUS PLANTS.

CLASS II. *Stamens below the pistil.*

Names.	*Examples.*	*Properties.*
7. Aroideae.	Wild turnip.	*Warming stomachic* and *antispasmodic*.
8. Typhae.	Cat tail.	*Weak tonic*.
9. Cyperoideae.	Sedge grass.	*Tonic*, coarse cattle fodder.
10. Gramineae.	Timothy grass.	*Tonic, farinaceous*, cattle fodder.

CLASS III. *Stamens surrounding the pistil.*

11. Palmae.	Date, cocoanut.	*Weak tonic, farinaceous*.
12. Asparagi.	Solomon seal.	*Secernant stimulant, mild tonic*.
13. Junci.	Sweet flag.	*Secernant stimulant, antiscorbutic*.
14. Liliaceae.	Tulip, addertongue.	*Emollient*, weak *secernant stimulant*.
15. Bromeliae.	Pine-apple.	*Refrigerant*.
16. Asphodeli.	Onion, hyacinth.	*Expectorant, tonic, cathartic*.
17. Narcissi.	Daffodil.	Weak *tonic, emollient*.
18. Irides.	Iris, blue-eyed-grass.	*Antiscorbutic, tonic*.

CLASS IV. *Stamens on the pistil.*

19. Musae.	Bread-tree.	*Tonic*.
20. Cannae.	Ginger.	*Warming stomachic*.
21. Orchideae.	Ladies' slipper.	*Emollient, stomachic, farinaceous*.
22. Hydrocharides.	Tape grass.	*Weak tonic*.

DICOTYLEDONOUS PLANTS.

Section first, flowers apetalous.

CLASS V. *Stamens on the germ.*

23. Aristolochiae.	Wild ginger.	*Tonic, warming stomachic*.

CLASS VI. *Stamens surrounding the germ.*

24. Aeleagni.	Pepperage tree.	*Weak tonic*.
25. Thymeleae.	Leather-wood.	Mild *emetic, antiscorbutic*.
26. Proteae.	Silver tree.	Weak *tonic*.
27. Lauri.	Sassafras.	*Secernant stimulant, stomachic*.
28. Polygoneae.	Dock, rhubarb.	Mild *cathartic, antiscorbutic*.
29. Atriplices.	Beet, pokeweed.	*Aperient, cathartic*.

CLASS VII. *Stamens below the germ.*

30. Amaranthi.	Cock's comb.	*Weak tonic, secernant stimulant*.
31. Plantaginea.	Plantain.	*Emollient*.
32. Nyctagines.	Four-o-clock.	*Cathartic, emetic*.
33. Plumbagines.	Sea-lavender.	*Cathartic, tonic*.

Section second. Flowers monopetalous.

CLASS VIII. *Corollas below the germ.*

34. Lysimachiae.	Loosestrife.	Weak *tonic, secernant stimulant*.
35. Pediculares.	Snakeroot.	*Tonic, cathartic*.
36. Acanthi.	Malabar nut.	*Emollient*, weak *tonic*.
37. Jasmineae.	Ash, lilac.	*Tonic, secernant stimulant*.
38. Vitices.	Vervain.	*Deobstruent, secernant stimulant*.

Class II.—Class III.—Class IV.—Class V.—Class VI.—Class VII.—Class VIII.—

Names.	*Examples.*	*Properties.*
39. Labiatae.	Sage, catnip.	*Secernant stimulant, stomachic, tonic.*
40. Scrophulariae.	Foxglove.	*Narcotic, absorbent, deobstruent.*
41. Solaneae.	Red pepper, henbane.	*Narcotic, cathartic, warming stomachic.*
42. Boragineae.	Comfrey.	*Astringent, vulnerary, emollient.*
43. Convolvuli.	Jalap, dodder.	*Cathartic.*
44. Polemonia.	Lichnidia.	*Feeble tonic.*
45. Bignoniae.	Snake-head.	*Cathartic, narcotic.*
46. Gentianae.	Caroline Pink.	*Cathartic, tonic.*
47. Apocyneae.	Milkweed.	*Cathartic, narcotic, deobstruent.*
48. Sapotae.	Sour sop.	*Cathartic, antispasmodic.*

Class IX. *Corollas surrounding the germ.*

49. Guaiacanae.	Lignum vitae.	*Tonic, warming stomachic.*
50. Rhododendra.	Laurel.	*Tonic, narcotic.*
51. Ericae.	Wintergreen.	*Tonic, astringent, refrigerant.*
52. Campanulaceae.	Lobelia.	*Cathartic, emetic, deobstruent.*

Class X. *Corollas on the germ—anthers united.*

53. Cichoraceae.	Lettuce, endive.	*Aperient, mild anodyne.*
54. Cinarocephalae.	Thistle, burdock.	*Tonic*, if nauseous, *cathartic.*
55. Corymbiferae.	Boneset, fleabane.	*Tonic, secernant, stimulant.*

Class XI. *Corollas on the germ—anthers separate.*

56. Dipsaceae.	Button bush, teasel.	*Weak tonic.*
57. Rubiaceae.	Bedstraw, venus pride.	*Weak tonic, aperient.*
58. Caprifolia.	Elder, dogwood.	*Tonic, cathartic* if nauseous.

Section third. Flowers polypetalous.

Class XII. *Stamens on the germ.*

59. Araliae.	Ginseng, spikenard.	*Tonic, expectorant.*
60. Umbelliferae.	Cicuta, fennel.	*Stomachic, narcotic,* if nauseous.

Class XIII. *Stamens below the germ.*

61. Ranunculaceae.	Crowfoot, gold thread.	*Narcotic, astringent.*
62. Papaveraceae.	Bloodroot, poppy.	*Narcotic, anodyne.*
63. Cruciferae.	Radish, cabbage.	*Emollient stomachic.*
64. Capparides.	Cleome, mignonette.	*Aperient, narcotic* if nauseous.
65. Sapindi.	Soap-berry.	*Emollient.*
66. Acera.	Maple tree.	*Aperient.*
67. Malpighiae.	Barbadoes cherry.	*Aperient.*
68. Hypericea.	John's wort, sundew.	*Tonic, vulnerary.*
69. Guttiferae.	Misseltoe-rose.	*Expectorant, secernant, stimulant.*
70. Aurantia.	Orange, lemon.	*Tonic, refrigerant.*
71. Meliae.	Tea.	*Astringent, anodyne.*
72. Vites.	Grape.	*Astringent, refrigerant.*
73. Gerania.	Wood-sorrel, geranium.	*Tonic, refrigerant, narcotic* if nauseous.
74. Malvaceae.	Hollyhock.	*Emollient, aperient.*
75. Magnoliae.	White wood.	*Tonic, aperient.*
76. Annonae.	Custard apple.	*Tonic, aperient.*
77. Menisperma.	Moonseed.	*Feeble narcotic.*
78. Berberides.	Witch hazel.	*Astringent, refrigerant.*
79. Tiliaceae.	Basswood.	*Emollient, aperient.*
80. Cisti.	Rock-rose, violet.	*Tonic.*
81. Rutaceae.	Rue.	*Caustic, narcotic.*
82. Caryophilleae.	Pink, flax.	*Emollient, aperient.*

Class IX.—Class X.—Class XI.—Class XII.—Class XIII.

Class XIV. *Stamens surrounding the germ.*

Names.	*Examples.*	*Properties.*
83. Sempervivae.	Houseleek, live-forever.	*Emollient, vulnerary.*
84. Saxifragae.	Saxifrage, currant leaf.	*Tonic.*
85. Cacti.	Prickly pear, currant.	*Refrigerant, emollient, tonic.*
86. Portulacceae.	Purslane.	*Emollient, vulnerary.*
87. Ficoideae.	Ice plant.	*Emollient, refrigerant.*
88. Onagrae.	Scabish.	*Tonic, aperient.*
89. Myrti.	Mock orange.	*Tonic.*
90. Melastomae.	Deer-grass.	*Feeble tonic.*
91. Salicariae.	Willow herb.	*Deobstruent, cathartic.*
82. Rosaceae.	Apple, rose, peach.	*Refrigerant, tonic, astringent.*
93. Leguminosae.	Cassia, pea, clover.	*Aperient, emollient.*
94. Terebintaceae.	Sumach, butternut.	*Cathartic, emetic, narcotic.*
95. Rhamni.	Winter berry, Jersey tea.	*Cathartic, tonic.*

Section fourth. Diclinious or anomalous.

Class XV. *Flowers mostly apetalous.*

96. Euphorbeae.	Castor bean.	*Cathartic,* mild *emetic.*
97. Cucurbitaceae.	Cucumber, melon.	*Cathartic, refrigerant.*
98. Urticae.	Hop, hemp, fig.	*Tonic, anodyne.*
99. Amentaceae.	Oak, willow, elm.	*Astringent, tonic, emollient.*
100. Coniferae.	Pine tree, cedar.	*Expectorant, secernant, stimulant.*

We shall, hereafter, in considering more fully the principles of classification, remark on the comparative merits of the most important methods of botanical arrangement. As our object at this time, is to prepare you for the analysis of plants, it may be well to give you a few simple rules for pronouncing their names, which being derived from foreign languages, cannot be accented or divided like analogous English words.

DIRECTIONS

FOR PRONOUNCING THE NAMES OF PLANTS.

Botanical names of plants are formed according to the analogies of the ancient languages, chiefly the Latin. Some of the most common terminations of names of Genera and Species, are in the letters *a*, *um*, *us*, and *is;* for example, GERARDIA, TRIFOLIUM, PRUNUS, IRIS; and *virginica*, *candidum*, *blandus*, *officinalis*. A very great proportion of Botanical names terminate in *a*, in which case the *a* has the sound of a in father, as Rosa, Viola, &c.

The letter *e* at the end of a word is always to be sounded; for example, *anemone*, pronounced anem-'o-ne.

The *e* is long before *s* when it ends a word as Bicor'*nes*

In words that end in *idès*, the *i* is long, as in Hesper'ides.

Class XIV.—Class XV.—
Rules for pronouncing the names of plants.—

The vowels *ae* and *oe* are often used as dipthongs, when they have the sound of *e*, as Hepaticae, pronounced He-pat'i-ee.

Dioecia, pronounced Di-e-cia.

C and *g* as in English, are soft before *e*, *i*, and *y*, and hard before *a*, *o*, and *u*.

The soft sound of *c* is like *s*, the hard sound like *k*.

The soft sound of *g* is like *j*, the hard sound like *g* in the word gave; thus Algae is pronounced Al-je.

Musci Mus-si.

The letters *ch* are hard like *k*, as in Orchis; pronounced Orkis.

LECTURE VI.

Method of analyzing Plants by a series of comparisons.—General remarks upon plants.—Method of preserving Plants for an Herbarium.—Poisonous Plants, and those which are not poisonous.

When we dissect a plant, or examine separately each of its organs, this is properly analysis; for the meaning of the word analysis is a separation; but when we speak of finding out plants by analyzing them, we mean something more than examining each part of the flower; this is indeed the first step in the process; but by means of observing these organs, we are to ascertain the Class, Order, Genus, and lastly the Species of the plant. "A person engaged in ascertaining the name of a plant, may be said to be upon a *Botanical Journey*, and the plant being his Directory; if he can read the botanical characters impressed on it by the hand of Nature, he will, by following system, soon arrive at his journey's end."*

In the first place we have *two comparisons* to make.

1st. Whether the *Stamens* and *Pistils* are VISIBLE.

2nd. Whether they are INVISIBLE.

If the Stamens and Pistils are not visible, we have already arrived at the class which is CRYPTOGAMIA.

If, however, the *Stamens* and *Pistils* are *visible*, we have now two *comparisons* to make.

* Thornton.

Meaning of the word analysis—How used in botany—What two comparisons to be first made in analyzing a plant—

1st. Whether the flowers have *Stamens and Pistils together.*

2nd. Whether the *Stamens and Pistils* are placed *on different corollas.*

If the Stamens and Pistils are on different flowers, we then shall find our plant either in the class *Diœcia*, or *Monœcia;* according as the Stamens and Pistils are on different flowers, proceeding from the same root, or from different roots.

But if our plant has the Stamens and Pistils both inclosed in the *same corolla*, we must next examine,

1st. Whether the *Anthers* are *Separate* or,

2nd. Whether the *Anthers* are *united.*

If we find *five anthers united* around the *pistil*, we have found the class of our plant, it is SYNGENESIA.

If the *Anthers* are separate, we must proceed to a *fourth stage*, and see,

1st. Whether the *filaments* are *separate*, or,

2nd. Whether the *filaments* are *united* with each *other*, or,

3d. Whether the *filaments* are *united* with the *pistil.*

If the latter circumstance is ascertained, we need search no farther, it is the class GYNANDRIA.

If the flower has not the filaments united to the pistil, we must ascertain if the filaments are united with each other; if they are so, and in two parcels or sets, the flower is in the class DIADELPHIA.

If in *one* parcel or *set*, it is in the class MONADELPHIA.

But if the *filaments* are *separate*, we must next examine,

1st. Whether these are *similar* in length, or,

2nd. Whether they are of different lengths.

Of different *lengths*, those only which have *four* or *six stamens* are to be regarded.

If we find our flower has *six stamens four long* and *two short*, we need go no farther, this is the class TETRADYNAMIA.

If the flower has four stamens, two long, and *two short*, it is in the class DYDYNAMIA.

If our flower comes under none of the foregoing heads, we must then count the number of stamens; if these amount to *more* than ten, we must then consider their *insertion*, as,

1st. Whether inserted *on the calyx or corolla*, or,

2nd. Whether inserted *on the Receptacle.*

If we find the Stamens inserted on the *Receptacle*, the class is POLYANDRIA; but if on the *Calyx* or *Corolla*, it is ICOSANDRIA.

When the stamens and pistils are visible what comparison is to be made —When the stamens and pistils are inclosed in the same corolla what is next to be considered—When the anthers are separate what must be observed—If the filaments are separate what must be observed—If the flower has neither four or six stamens of unequal length, what is to be observed— When is the flower in one of the first ten classes.—

If our flower has less than twenty stamens, with none of the peculiarities above mentioned, of *connexion*, *position*, or *length*, we have only to count the number of stamens in order to be certain of the class; if there are *ten* stamens, it is DECANDRIA; and so on through the nine remaining classes. This is the true analytical process; but when we put plants together to form a species, and species together to form a genus, and genera together to form an order, and orders together to form a class, we then proceed in the way of Synthesis, which means putting together; Analysis means separating.

Although we are soon to enter into a particular consideration of all the parts of a vegetable, both as to its external appearance, and its various offices, and internal operations; it may be well to give, at this time, a view of some subdivisions and different forms, of the Calyx, Corolla, Nectary, and Pericarp.

GENERAL FACTS RELATING TO VEGETABLES.

Plants are furnished with pores, by which they imbibe nourishment from surrounding bodies. The part which fixes the plant in the earth, and absorbs from it the juices necessary to vegetation, is the *root;* this organ is never wanting.

The *stem* proceeds from the root, sometimes it creeps upon the earth, or remains concealed in its bosom; but generally the stem ascends either by its own strength, or, as in the case of vines, by supporting itself upon some other body. The divisions of the stem are its *branches;* the divisions of the branches are its *boughs*. When the vegetable has no stem, the flower and fruit grow from the tops of the root; but when the stem exists, that or its branches bear the leaves, flowers, and fruits. *Herbs* have generally soft, watery stems of short duration, which bear flowers once, and then die.

Trees and *shrubs* have solid and woody stems; they live and bear flowers many years.

Small bodies, of a round or conical form, consisting of thin scales, lying closely compacted together, appear every year upon the stems, the boughs, and the branches of trees. They contain the *germs* of the productions of the following years, and secure them from the severity of the seasons. These germs, and the scales which cover them, are called *buds*. If our organs of sight were sufficiently acute, it is supposed we might distinguish in a bud the innumerable future plants which are enveloped in it, to be brought forward perhaps while the earth shall exist.

Difference between analysis and synthesis—The Root—Stem—Branches—Boughs—Herbs—Trees and shrubs—Buds.—

The buds of the trees and shrubs of equinoctial countries, have few scales, as they are less needed for protection against inclemencies of weather.

Leaves are the lungs of vegetables; they absorb water and carbonic acid from the atmosphere, decompose them by the action of rays of light, and exhale or give out oxygen gas. They are usually connected at the base by a kind of stem called a *petiole*, are sometimes accompanied by *stipules*, appendages similar to little leaves.

Vegetables, like other organized beings, produce others of their kind, and thus perpetuate the works of creation. The organs essential to the perfection of plants, are the stamens and pistils. Those plants in which the stamens and pistils are manifest, are called *Phenogamous;* where these are rather suspected than demonstrated to exist, they are called *Cryptogamous.* The presence of a stamen and pistil constitutes a perfect flower; but in general these are surrounded with an envelope called the *corolla*, and an outer one called the *calyx*. Persons ignorant of botany give exclusively the name of flower to these envelopes, which are often remarkable for the brilliancy of their colours, the elegance of their forms, and the fragrance of their perfumes.

METHOD OF PRESERVING PLANTS.

AND OF PREPARING AN *herbarium.*

PLANTS collected for analysis, may be preserved fresh many days in a close tin box, by occasionally sprinkling them with water; they may also be preserved by placing their stems in water, but not as well by the latter, as the former method. While attending to the science of Botany, you should keep specimens of all the plants you can procure. An herbarium neatly arranged is beautiful, and may be rendered highly useful, by affording an opportunity to compare many species together, and it likewise serves to fix in the mind the characters of plants. It is a good method in collecting plants for an herbarium, to have a port-folio, or a book in which they may be placed before the parts begin to wilt. Specimens should be placed between the leaves of paper, either newspaper or any other kind which is of a loose texture, and will easily absorb the moisture of the plants; a board with a weight upon it should then be placed upon the paper containing them; the plants should be taken out frequently at first; as often as once or twice a day, and the paper dried, or the plants placed between other dry leaves. Small plants may be dried between the leaves of a book.

Plants differ in the length of time required for drying as they are more or less juicy; some dry in a few days, others not sooner than two or three weeks. When the specimens are dry, and a sufficient number collected to commence an herbarium, a book should be procured, composed of blank

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Leaves—Phenógamous and Cryptogamous plants—Method of preserving plants—of preparing an herbarium.—

paper, (white paper gives the plants a more showy appearance.) A quarto size is more convenient than a larger one; upon the first page of each leaf should be fastened one or more of the dried specimens, either with glue or by means of cutting through the paper, and raising up loops under which the stems may be placed. By the sides of the plants should be written the *class*, *order*, *generic*, and *specific name;* also, the place where found, and the season of the year. The colours of plants frequently change in drying; the blue, pale red, and white, often turn black, or lose their colour; yellow, scarlet, violet and green, are more durable. An herbarium should be carefully guarded against moisture and insects. Some, as a security against the latter, brush the plants over with corrosive-sublimate.

As a healthful and agreeable exercise, we would recommend to you in summer, frequent botanical excursions; you will experience more pleasure from the science, by seeing the flowers in their own homes; a dry grove of woods, the borders of little streams, the meadows, the pastures, and even the way-sides will afford you constant subjects for botanical observations. To the hardier sex, who can climb mountains, and penetrate marshes, many strange and interesting plants will present themselves, which cannot be found except in their peculiar situations; of these you must be content to obtain specimens, without seeing them in their native wilds. You will no doubt easily obtain such specimens, for there is usually among the cultivators of natural science, a generosity in affording assistance to others, and imparting the treasures which nature lavishes upon those who have a taste to enjoy them.

POISONOUS PLANTS AND THOSE WHICH ARE NOT POISONOUS.

In collecting flowers, you should be cautious with respect to *poisonous* plants. Such as have five stamens and *one pistil*, with a corolla of a dull, lurid colour, and a disagreeable smell, are usually poisonous; the Thorn apple (*stramonium*) and the Tobacco are examples. The Umbelliferous plants, which grow in *wet* places, have usually a nauseous smell: such plants *are poisonous*, as the Water hemlock. Umbelliferous plants which grow in dry places, usually have an aromatic smell, and *are not poisonous*, as Caraway and Fennel.

Plants with *Labiate* corollas, and containing their seeds in capsules, are often poisonous, as the Foxglove; (Digitalis;) also, such as contain a *milky juice*, unless they are compound flowers. Such plants as have horned or hooded nectaries, as the Columbine and Monk's-hood, are mostly poisonous.

Among plants which are seldom poisonous, are the compound flowers, as the Dandelion and Boneset; such as have labiate corallas, with seeds lying naked in the calyx, are said never to be poisonous: the Mint and Thyme are examples of such plants. The *Papilionaceous* flowers, as the pea and bean, the *Cruciform*, as the radish and mustard, are seldom found to be poisonous. Such plants as have their stamens standing on the calyx, as the Rose and Apple, are never poisonous, neither the grass-like plants with glume calyxes, as Wheat, Rye, and Orchard grass, (Dactylis.)

PROPER FLOWERS FOR ANALYSIS.

In selecting flowers for analysis, you must never take double ones; the stamens (and in many cases the pistils also) change to petals by cultivation, therefore you cannot know by a double flower, how many stamens or pistils belong to it in its natural state. Botanists often view with some degree of indignation, the distortions of nature, as they term it, by means of differ-

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Botanical *excursions*—Poisonous plants—Plants seldom poisonous—Double flowers not proper for analysis.

ent modes of cultivation; they call the double flowers and the variegated ones, produced by a mixture of different species, *monsters* and *deformities.* These are rather harsh expressions to be applied to Roses and Carnations, which our taste must lead us to admire as intrinsically beautiful, although their relative beauty, as subservient to scientific illustration, is certainly destroyed by the labour of the gardener. The love of native wild flowers is no doubt greatly heightened by the habit of seeking them out, and observing them in their peculiar situations; a Botanist will often, at the discovery of some lowly plant, growing by the side of a brook, or almost concealed in the cleft of a rock, experience a more vivid delight than could be produced by a view of the most splendid exotic. Botanical pursuits render us interested in every vegetable production; even such as we before looked upon as useless, present attractions, as objects of scientific investigation, and become associated with the pleasing recollections, arising from the gratification of our love of knowledge.*

GENERAL REMARKS.

It is desirable, that the parlours of those ladies, who have the advantages of intellectual improvement, should more frequently exhibit specimens of their own scientific taste. All the fashionable *et ceteras* of scrap books, engravings and albums, do not reflect upon their possessor any great degree of credit. To paste pictures, or pieces of prose or poetry, into a book; or to collect in an album the wit and good sense of others, are not proofs of one's own acquirements; and the possession of elegant and curious engravings, indicates a full purse, rather than a well stored mind; but *herbariums* and books of *impressions of plants*, drawings, &c, show the taste, and scientific knowledge of those who execute them.

It is unfortunately too much the case, that female ingenuity, (especially in the case of young ladies after leaving school) is in a great degree, directed to trivial objects, which have no reference either to utility, or to moral and intellectual improvement. But a taste for scientific pursuits once acquired, a lady will feel that she has no time for engagements, which neither tend to the good of others, or to make herself wiser or better.

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* MANNER OF TAKING IMPRESSIONS OF LEAVES.—Hold oiled paper over the smoke of a lamp until it becomes darkened; to this paper, apply the leaf, having previously warmed it between the hands, that it may be pliant. Place the lower surface of the leaf upon the blackened paper, that the numerous veins which run through its extent, and which are so prominent on this side, may receive from the paper, a portion of the smoke. Press the leaf upon the paper, by placing upon it some thin paper and rubbing the fingers gently over it, so that every part of the leaf may come in contact with the sooted oil paper. Then remove the leaf, and place the sooted side upon clean white paper, pressing it gently as before; upon removing the leaf, the paper will present a delicate and perfect outline, together with an accurate exhibition of the veins which extend in every direction through it, more correct and beautiful than the finest drawing.

Monsters—Effect of Botanical pursuits.—General remarks on females possessing scientific knowledge.—Female ingenuity too often directed to trivial objects.

PART II.

LECTURE VII.

Importance of observing external objects.—Vegetables consist of two sets of organs.—Of the root—The Stem.

The exercises which constitute the principal part of our previous course of lectures, are chiefly designed to assist you in practical botany. It is not expected that you are to be the passive receivers of instruction, but are to compare with real objects, the descriptions, with which you are presented; by doing this faithfully, you will find your minds gradually strengthened, and more competent to compare and judge in abstract studies, where the subjects of investigation are in the mind only, and cannot, like the plants, be looked at with the eyes and handled with the hands.

All our thoughts, by means of the senses, are originally derived from external objects. Suppose an infant to exist who could neither hear, see, taste, smell, nor feel; all the embryos of thought and emotion might exist within it; it might have a soul capable of as high attainments as are within the reach of any created beings; but this soul, while thus imprisoned, could gather no ideas; the beauty of reflected light, constituting all the variety of colouring, the harmony of sounds, the fragrant odors of flowers, the sensations of various flavors, which are derived from our sense of taste, the ideas of soft, smooth, or hard; all these sensations must forever remain unknown to the soul confined to a body, unblest with the means of communication with the world around it: such a soul might be compared to the embryo of a plant, which, enclosed within the prison of a seed, would forever remain inert, were no means provided for its escape from this confinement, and no communication opened between it and the air, the light, and the vivifying influence of the earth.

Since our first ideas are derived from external objects, is it

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Study of external objects strengthens the mind—Abstract studies facilitated by acquaintance with the natural sciences—our first ideas derived from external objects—

not a rational conclusion that we should add to this original stock of knowledge, by a continued observation of objects addressed to our senses? After the years of infancy are past, and we begin to study *books*, and to attain *what is called learning;* should we then, neglecting sensible objects, seek only to gain ideas from the learned?

Having now enabled you to understand the method of analysing plants, we shall proceed to consider more fully the different organs of plants, with the uses of each in the vegetable economy.

In plants, as well as animals, each part or organ, is intimately connected with the whole; and the vegetable, as well as the animal being depends for its existence on certain laws of organization.

We shall consider the vegetable organs under two classes; the first including such organs as promote the growth of the plant; the second such as perfect the seed, and thus provide for the reproduction of the species.

Organs which promote the growth of the plant.

1st. The *Root*, or descending part.
2d. The *Stem*, which elevates and sustains the branches.
3d. The *Leaves*, which are the lungs of plants, inhaling nutritious gases, and exhaling such as are not needed for the growth of the plant.
4th. The *appendages*, as leafets, tendrils, thorns, &c.

Ogarns which perfect the seed.

1st. The *Calyx*, or outer part of the flower.
2d. The *Corolla*, or coloured blossoms within the Calyx, or enclosing the stamens.
3d. The *Stamens*, organs surrounding the central one.
4th. The *Pistil*, central organ.
5th. The *Pericarp*, covering of the seed.
6th. The *Seed*, the essential part which contains the rudiments of a new plant.
7th. The *Receptacle*, or base of the flower, being the end of the flower stem.

Vegetable as well as animal existence depends on certain laws of organization—Two kinds of organs of vegetables—The first set of organs—The second set—

- Organs of nutrition, or parts necessary to the growth of the plant.
  - THE ROOT.
    - *caudex,*
    - *radicles,*
  - THE STEM.
    - *branches,*
    - *petioles,*
    - *peduncle,*
  - THE BUD.
    - *scales,*
  - THE LEAF.
    - *leafets,*
  - APPENDAGES.
    - *stipules,*
    - *prickles,*
    - *thorns,*
    - *glands,*
    - *stings,*
    - *scales,*
    - *tendrils,*
    - *pubescence,*
    - *bracts,*
- Organs of reproduction, or parts of fructification.
  - THE FLOWER.
    - CALYX *divisions are called leaves.*
    - COROLLA *divisions are called petals.*
    - NECTARY
      - *sometimes a part of the corolla,*
      - *sometimes a separate organ,*
    - STAMEN
      - *filament,*
      - *anther,*— pollen
    - PISTIL
      - *stigma,*
      - *style,*
      - *ovary or germ.*
  - THE FRUIT.
    - PERICARP
      - *Containing all parts of the fruit which are not the seed,*
      - *cells,*
      - *valves,*
      - *dissepiments,*
      - *columella.*
    - SEED
      - *hilum,*
      - *albumen,*
      - *cotyledons,*
      - *embryo.*—
        - *radicle.*
        - *plume.*

Synopsis of the organs of plants—

OF THE ROOT.

The *root* (radix) is that part of the vegetable which enters the earth, and extends in a direction contrary to the growth of the stem; it supports the plant in an upright position, and at the same time gives nourishment to every part of it. There are exceptions to the general fact, of a root being fixed in the ground, as some plants called *aquatic*, grow in the water; others called *parasitic*, have no root, but fix themselves upon other objects, and derive sustenance from them. The sea-weed is an example of aquatic, and the misseltoe of parasitic plants.

The Root consists of two parts, the *Caudex, or main body* of the root, and the *Radicle, or fibres;* these are a kind of capillary or hair-like tubes, which absorb the nourishment that is conveyed to other parts of the plant.

DURATION OF ROOTS.

Roots with respect to duration are *annual, biennial or perennial.*

Annual roots—are such as live but one year. They come from the seed in the spring, and die in autumn, including such as are raised from the seed every year: as peas, beans, cucumbers, &c.

Biennial roots—are such as live two years. They do not produce any flowers the first season, the next summer they blossom, the seeds mature, and the roots die. The roots of cabbages are often, after the first season, preserved in cellars during the winter. In the spring they are set out in gardens, and produce flowers; the petals of which, in time, fall off, and the germ grows into a pod or silique, which contains the seed. The root having performed this office, then dies, and no process can restore it to life; the flowering is thought to exhaust the vital energy or living principle. The onion, beet and carrot are biennial plants.

Perennial roots—are those whose existence is prolonged a number of years to an indefinite period; as the asparagus, geranium, and rose; also trees and shrubs. Climate and cultivation affect the duration of the roots of vegetables. Many perennial plants become annual by trasplanting them into cold climates: the garden nasturtion, originally a perennial shrub in South America, has become in our latitude an annual plant.

Definition of the root—Exceptions to a general fact—Division of the root—Annual roots—Biennial—Perennial.—

It is said, that, in some cases, great care in the culture will prolong the life of annual plants beyond what appears to be their natural term of existence.

FORMS OF ROOTS.

Roots present a multitude of forms: a very general classification of them into *fibrous*, *bulbous*, and *tuberous*, is made by some. Without adopting this arrangement, we shall give one which appears more definite.

There are seven varieties in the forms of roots, which seem mostly distinct: these are the *branching*, *fibrous*, *spindle*, *creeping*, *granulated*, *tuberous*, and *bulbous*.*

1st. *Branching Root*, (*Radix ramosa.*) This is the most common kind: it consists of numerous ramifications, resembling in appearance the branches of a tree; some of these branches penetrate to a great depth in the earth, and others creep almost horizontally near its surface. Experiments have been made, which show, that branches by being buried in the soil may become roots; and roots, by being elevated in the atmosphere become branches covered with foliage. We often see the roots of trees, which have been blown down, throwing out leaves.

Branching roots terminate in fibres or *radicles*, which are in reality the proper roots; as they imbibe through pores, the nourishment which the plant derives from the earth. Nature furnishes this nourishment in the moisture, and various salts which are contained in the soil.

2d. *Fibrous Root*, (*Radix fibrosa.*) This consists of a collection of thread like parts; as in many kinds of grasses, and most annual plants. The fibres usually grow directly from the bottom of the stem, as may easily be seen by pulling up a handful of the most common grass.

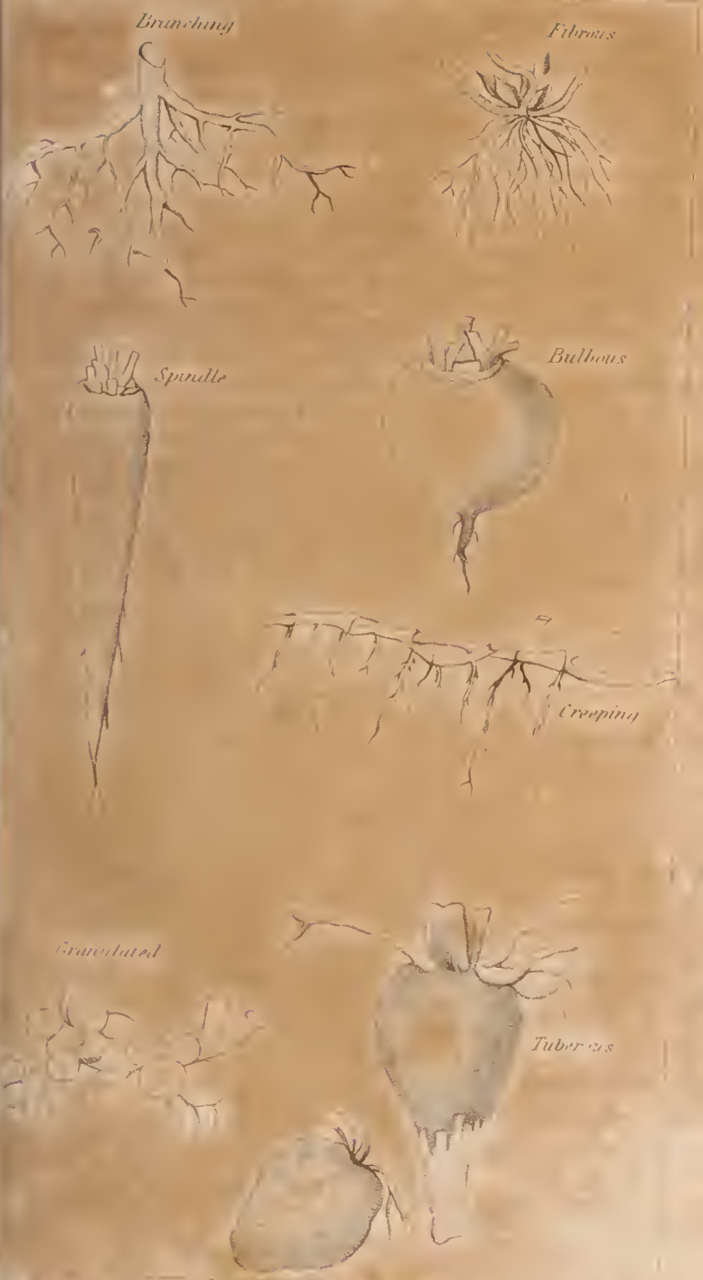
3d. *Spindle root* (*Radix fusiformis.*) This is large at the top, and tapering downwards; as beets, carrots, radishes, and many of the biennial plants. This root is not well provided with the means of imbibing sustenance, on account of a deficiency of radicles, sometimes being furnished with no more than one. That these radicles are the agents, by which the root is nourished, may be seen by immersing a young radish in water until every part is covered except the radicles; the herbage will soon die; but if only the

* See Plate IV.

• Classification of roots as founded upon their forms—Branching root—Importance of the radicles—Fibrous root—Spindle root—Deficient radicles—

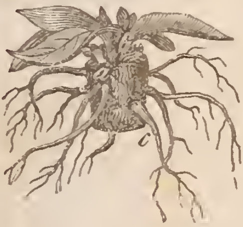
ROOTS

PLATE III



radicles of another radish are immersed in water, the plant will live and the leaves look fresh for some time. The spindle root is often *forked* as in the mandrake,* the divisions of which are thought to resemble the lower part of the human figure. Sometimes the spindle root instead of terminating in a point, appears as if the end had been cut or bitten off; this is called an abrupt root, or more scientifically, *premorse*, which signifies bitten. The violet and cowslip furnish examples of this kind of root. A foreign plant called the Devil's bit,† has received the name on account of its abrupt root; it having been superstitiously believed in former times, that as the plant was useful for medicine, the devil had, out of spite to mankind, bitten off the root.‡

Fig. 1. Premorse root.



4*th*. *Creeping* root (*Radix repens.*) This root, instead of forcing its way perpendicularly into the earth, extends horizontally, and sends out fibres. It is very tenacious of life, as any part of it containing a joint will grow. This root is sometimes useful, by its fibres spreading and entwining themselves, and thus rendering a soil more permanent.—Holland would be liable to be washed away by the action of water were it not that its coasts are bound together by these and other plants. This root will grow in sandy, light soils which scarcely produce any other vegetation.

5*th*. *Granulated* root (Radix *granulata.*) This consists of little bulbs or *tubers* strung together by a thread-like radicle; this form approaches to that of some varieties of the tuberous.

6*th*. *Tuberous* root (*Radix tuberosa.*) This kind of root is hard, solid, and fleshy; it consists of one knob or tuber; as in the potatoe; or of many such connected by means of a number of strings or filaments, as in the artichoke. These tubers are reservoirs of moisture, nourishment and vital energy. The potatoe then is in reality, but an excrescence, proceeding from the real root; and it is a singular fact that

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* *Atropa Mandragora.* The word mandrake is said to be derived from the German *Mandragen*, resembling man.

† Scabiosa succisa or a kind of Scabious.

‡ Plate IV represents the seven principal forms of roots; some of the less important distinctions are exhibited by the wood cuts.

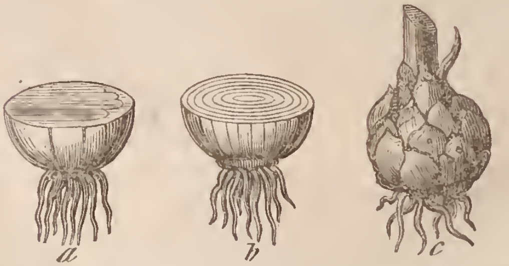
Forked spindle root.—Premorse root—Creepingr oot—Its importance in Holland—Granulated root—Tuberous root—Tubers, as the potatoe, not the real root—

this nutritious substance is the product of a plant whose fruit (often termed potatoe balls) is poisonous. The root of some of the orchis plants consists of two tubers, resembling the two lobes into which a bean may be divided. Tuberous roots are *knobbed* as in the potatoe; *oval*, as in the orchis; *abrupt*, as in the plantain; *fasciculated*, when several are bundled together, as in the asparagus, and several species of orchis.

7th. *Bulbous* root (*Radix bulbosa.*) A fleshy root of a bulbous or globular form. It seems to be like a large ball placed under ground, to enclose and protect the future plant. Bulbous plants produce some of the earliest flowers of spring, and afford some of the most beautiful ornaments of the garden. Among them are the Hyacinth, the Crown Imperial, the Lily, and the Tulip, with a great variety of other splendid and interesting flowers. The use of the bulb being to preserve the future flower from the effect of cold, we see the bountiful agency of Providence in the greater number of bulbous plants in cold countries.

Bulbs seem to be analogous to the buds of trees, and in some plants they grow like buds upon the stems or branches; as in one species of lily and the magical onion, in which the bulbs or onions grow upon the stalk in clusters of four or five; they continue to enlarge, until their weight brings them to the ground, here if not prevented, they take root. This is a *viviparous* plant, or one which produces its offspring alive; such plants as produce seeds, or such animals as produce their offspring from eggs, are called *oviparous.* Bulbs are *solid*, as in the turnips; *scaly*, as in the lily, and *tunicated* or ovated, as in the onion.

Fig. 2.



Solid. Scaly. Ovate.

Bulbs usually die after the blossoming of the plant; but new bulbs are often formed from the base or sides of the

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Different forms of tuberous roots—Bulbous root—Use of the bulb—Analogous to buds—Viviparous and oviparous plants—Different forms of bulbous roots—Difference in the production of plants by means of bulbs and seeds—

original bulb, which in their turn produce plants. This is the fact with respect to the orchis tribe; in which every year one bulb or tuber dies, and the other throws out a new stem; by this means it changes its position, though very slowly, since it takes but one very short step each year. The production by means of bulbs, is only a continuation of the old plant, while by means of the seed a new plant is brought forth.

This is an important distinction; and it is observed that in process of time, a plant continued by means of reproduction, whether by bulbs, grafting, or any other manner, ultimately dwindles and degenerates as if worn out with old age, and it becomes necessary to renew its vigour by producing a young plant from the seed. This is the case with the potatoe which is ordinarily produced from the root; but the farmer often finds his stock degenerated, and is obliged to provide himself with new roots produced from the seed.

The specific character of plants is sometimes taken from the root, and in some cases the specific name; as SOLANUM *tuberosum*, the potatoe, and RANUNCULUS *bulbosus*, the bulbous ranunculus. The tuberous and bulbous roots distinguish those species from all others of the families Solanum, and Ranunculus.

The forms of roots are so various, that it is impossible to give names to all; even in the same species of plants, the root presents many varieties of form. In the potatoe, for example, we see some, round and of an even surface, others, long or oval, and some very knobbed and irregular; but yet amidst all this variety there is a prevailing uniformity, and we can usually at one glance distinguish a potatoe, by its form, from all other vegetables. It might, at first, have appeared as if there could be little interesting in the consideration of roots, which are destitute of that symmetry of parts and liveliness of colouring, which is exhibited in other organs of the plant. Yet you will see, from the view we have now taken of the forms and uses of the root, that inquiries respecting it might be far extended. We find here, as in every part of nature, proofs of a wise Creator, who makes nought

"In vain, or not for admirable ends."

We have now described those roots which grow by being fixed in the earth. But besides these, there are plants which are not fixed, but float about in the water; some grow upon other plants, and some seem to derive sustenance from air alone.

Potatoes must be occasionally renewed from the seed—Specific character and name taken from the roots—Roots of the same species sometimes vary in form—

Of the first kind, or *aquatic roots*, is the Lemna or duckmeat, which grows in stagnant water, having thread-like roots, not confined to any fixed place. The water star grass* previous to its blossoming, floats about, and is nourished by its suspended fibres; but after flowering, it sinks to the bottom, its roots become fixed and its seeds ripen. These seeds germinating, a new race of plants appear, which rise to the surface of the water, blossom and sink to the earth, producing in turn their successors. Some of the Cryptogamous plants, particularly of the genus Fucus, exist in a wandering manner, often forming islands of considerable size.

We find roots which grow on other plants, appearing to derive sustenance from their juices. These are called *parasites*; this term is often applied to persons who are willing to live in dependence upon others; but so despicable does this trait of character appear, that we almost conceive it a kind of meanness even for a plant to live without elaborating its own food.

Parasitic plants are common in tropical regions; sometimes many kinds are found upon the same tree, presenting a curious variety of foliage. In our climate, except in the Cryptogamia family; as lichens, mosses, &c. we have but few genera of these plants.† The Dodder and Misseltoe are celebrated parasitic plants.

Some plants grow without roots, these are called *air plants*: they are furnished with leaves or stems which seem to *inhale*, but not to exhale fluids; their substance is usually fleshy and juicy; some of them flourish in the most dry and sandy places, exposed to a burning sun; as the *Stapelia*, sometimes called the *vegetable camel*. The *Epedendrum* grows and blossoms for years suspended from the ceiling of a room and nourished only by air.

STEMS AND STALKS.

The trunk or stem is the body of the vegetable; whether it be a tree like the oak, a shrub like the lilac, or an herb like the peppermint or sage; its use is to sustain the branches, leaves, and flowers; and it serves as an organ of communication between them and the root; conducting to the root the nourishment which the other parts of the plant imbibe from the air, and

* *Callitriche aquatica.*

† In the vicinity of Troy I have discovered a very beautiful species of the *Pterospora* growing upon a branch of the whortle berry. Its colour was a bright crimson, which contrasted finely with the white flowers, and green leaves of the plant on which it grew.

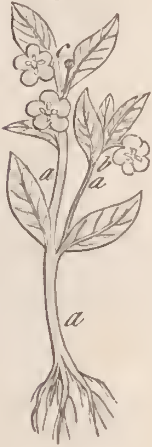
Aquatic roots—Parasitic plants—Air plants—Trunk—Its use—

returning to them the juices absorbed from the earth by the root. The stems of vegetables bear, in many respects, a striking analogy to the trunks of animals.

The different kinds of stems, or stalks, have been divided into seven classes, as follows:—

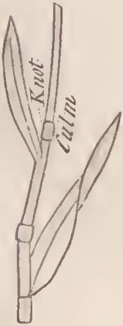
Caulis, *Tige*,* or proper stem, *Culm*, *Scape*, *Peduncle*, *Petiole*, and *Stipe*.

Fig. 3.



1st. *Caulis*, *Tige*, or proper stem, is such as is seen in forest trees, in shrubs, and in most annual plants. The caulis is either simple, as in the white lily; or branching as in the geranium; the branching is the more common form. You have here the representation of a *caulis*, or proper stem,(*a*) a *peduncle*, or flower stalk,(*b*) and the *petiole*, or leaf stalk, (*c*).

Fig. 4.



2d. *Culm*, or straw, is the kind of stem which you see in the grasses and rushes. The culm is either *without knots*, as in the bulrush, *jointed* or *knotted*, as in wheat and indian corn, *geniculated* or bent like an elbow, as in some of the grasses; the two latter divisions are not distinct, for those culms which are bent, are also knotted, though they may be knotted without being bent. The Bamboo, Sugar Cane, and various species of Buds have stems of the culm kind; some of them, particularly the Bamboo, are known to attain the height of forty feet.

* Tige is a French word; the *i* should, therefore, be sounded like *e*, the *g* soft, like *j*, as *teje*.

Stems analogous to the the trunks of animals—Division of stems—Caulis —Culm—

Fig. 5.

3d. *Scape*, a stalk springing from the root, which bears the flower and fruit, but not the leaves; as the Dandelion, the Cowslip, and the Lily of the Valley, (*a a Fig.* 5.) Plants with scapes are sometimes called stemless plants; in this case, the scape would be considered as a peduncle proceeding from the root.

4th. *Peduncle*, or flower stalk, springs from the principal stem, it bears the flower and fruit, but not the leaves; when the peduncle is divided, each subdivision is called a pedicel.*

The peduncle, or flower stalk, is,

Cauline, when it grows immediately out of the main stem;
Rameous, or branching, when it grows out of a main branch;
Axillary, growing between a leaf and stem, or between a branch and stem;
Terminal, when it terminates a stem or branch;
Lateral, when situated on the side of a stem or branch;
Uni-flora, bearing one flower; bi-flora, two flowers; tri-flora, three flowers;
Multi-flora, bearing many flowers.

When there is no peduncle or flower stalk, the flowers are said to be *sessile.*

5th. *Petiole.* The petiole or leaf stalk, is a kind of stem, like a fulcrum, supporting the leaf; it is usually green, like the leaf, and appears to be a part of the leaf itself. The petiole of many plants is somewhat in the form of a cylinder; but the upper surface is rather flattened, the under surface convex. You will find this remark useful, in distinguishing the foot-stalks of compound leaves, from young branches, with which they are sometimes confounded. In most cases, the leaves and flowers are supported by distinct foot-stalks, but sometimes the foot-stalk supports both the leaf and flower.

The petiole may be,

Terete, round, as in the Holly-hock;
Semi-Terete, half round, as in the Yellow water-lily;
Compressed, flattened, as the Poplar;
Alated, winged, or furnished on each side with a leafy appendage;
Cirriferus, having tendrils, as the Pea;
Climbing, performing the office of a tendril, as the CLEMATIS *virginica.*

The Petiole is often, in examining different species of plants,

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* In determining the species of plants, we often consider the length of the peduncle, compared with the flower: as whether the peduncles are longer or shorter.

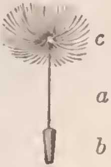
Scape—Peduncle—Petiole—

compared with the leaf; as the peduncle is with the flower, with regard to their relative length.

Fig. 6.

6th. *Frond.* The term Frond, belongs entirely to Cryptogamous plants; it is a kind of stem, in which the leaf and fructification are united; or rather, the flowers and fruit are produced from the leaf itself; as in the Fern. Linnæus considered the palm trees as fronds, as they have not the proper stem of a tree; but they are rather herbs, whose stalks bear the flowers and fruit. Here is the sketch of a fern, its stem, (*Fig.*6, *a*) is called a *frond.*

Fig 7.



7th. *Stipe*, is the stem or leafless part of a frond, or the stalk of a fungus or mushroom. The term is also applied to the slender thread, which in many of the compound flowers, elevates the hairy crown, with which the seeds are furnished, and connects it with the seed. Thus, in the seeds of the Dandelion, which is here represented, the column, (*Fig.* 7, *a*,) standing on the seed (*b*,) and elevating the down (*c*) is the stipe.

Fig. 8.

Here is a mushroom with the cap (*Fig.* 8, *d*) elevated on a stem (*e*) which is its stipe.

Having considered the different kinds of stems, according to the division which most botanical writers have made, we will now notice some general circumstances relating to them, without reference to any one of these classes of stalks in particular; although these remarks will be mostly applicable to the Tige or Caulis, which is the most common kind of stem.

The *coherence* or *hardness* of stems has given rise to the following distinctions.

Herbaceous, having a tender substance, which usually dies every year; in some cases when the root lives more than one year, the stem is annual; as in the tulip; *Woody*, as in the oak; *Solid*, like the box; *Pithy*, as the elder; *Hollow*, as in the onion; *Corky*, as in the cork; or *Pulpy*, as in the cactus or prickly pear.

Frond—Stipe—

The stem with respect to its *direction*, or *mode* of *growth*, is

Perpendicular, or erect, forming a right angle with the ground, as the Pink;

Procumbent, lying down;

Oblique, when it is neither perpendicular nor horizontal;

Creeping, as one species of Ranunculus;

Reclining, curved towards the ground as the Blackberry.

Radical, clinging to some other body for support, by means of fibres which do not imbibe nourishment; as the common Creeper;

Climbing, either with spiral tendrils for its support, as the Vine, or by adhesive fibres;

Twining, winding in a spiral manner around other plants, as the Hop;

Trailing, a creeping stem destitute of flowers, thrown out from the root and giving rise to another plant where it takes root, as the Strawberry.

Stems as to *shape*, are,

Terete or *cylindrical*, long and round; as in the rose and lilac, and in most of the woody and herbaceous plants;

Compressed, more or less flattened on the sides;

Anceps, two edged;

Triangular, three edged;

Quadrangular, square, or four sided;

Pentagonous, five sided. If the number of angles is either variable, or more than five, the stem is said to be *angulosus*, or angled.

The *surface* of the stem may be,

Glabrous, smooth, destitute of hairs or glands;

Polished, the surface equal and smooth;

Pubescent, covered with hair, or glands resembling hairs;

Villose, shaggy, covered with long soft hairs;

Pilose, hairs long and distinct;

Tomentose, hairs short and closely matted together, like cotton or down;

Hispid, bristly, hairs stiff;

Scaly, covered with membranous scales;

Imbricated, stem concealed by leaves, which sit close like shingles on the roof of a house;

Viscid, covered with a clammy juice;

Papillose, covered with soft points or tubercles;

Scabrous, rough to the touch;

Hoary, as if frosted;

Mealy, (glaucus,) of a sea green mealiness, which easily rubs off;

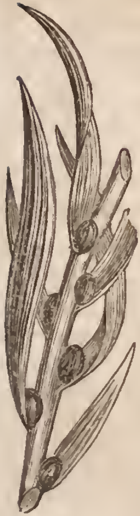
Striated, marked with parallel longitudinal lines.

The Stem with respect to Divisions and Composition.

The stem is either *simple*, or *divided* into branches. The branches are parts of the plant which proceed immediately from the trunk; the divisions of the branches are called branchlets; a diminutive appellation, which means a little branch. These parts resemble, in their formation, the trunk or stem, which furnishes them; the branch may be considered as a tree, implanted upon another tree of the same species.

Stems with respect to hardness—Direction—Shape—Surface—Divisions—Bulb-bearing stems—

Fig. 9.



Some stems are remarkable for bearing *bulbs* in the axils of their leaves. These bulbs like the bulbous root, contain within them the germ of a new plant. The Lilium bulbiferum, or bulb-bearing lily is of this description, (*Fig.* 9.)

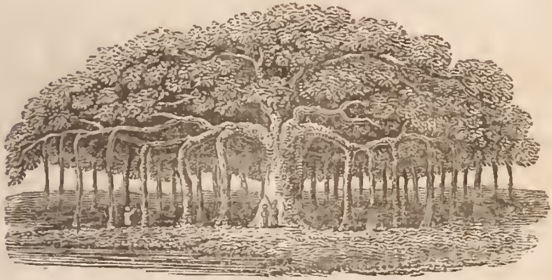
A remarkable phenomenon is described by travellers, as being exhibited by the stems of the Banyan tree of India, *Ficus Indicus;* their stems throw out fibres, which descend and take root in the earth. In process of time these stems become large trees, and thus from one primitive root, is formed a little forest. This tree is called by various names; as the Indian-God-tree, the arched-Fig-tree, &c.

The Hindoos plant it near their temples, and in many cases, the tree itself serves them for a temple. Milton speaks of this tree as the one from which Adam and Eve, obtained leaves to form themselves garments; he says it was not the figtree renowned for fruit, but

"Such as at this day to Indians known
In Malabar or Decan, spreads her arms,
Branching so broad and long, that in the ground
The bended twigs take root, and daughters grow
About the mother tree, a pillar'd shade
High over-arched, and echoing walks between."

You have here a description of this wonderful tree, which is said to have given shelter to an army of seventy thousand men.

Fig. 10.



Ficus Indicus.

All the varieties of stems which we have now considered may be included under two divisions; 1st. such as grow externally

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Rooting stems—Stems included in two divisions.

having their wood arranged in concentric layers, the oldest being in the centre of the trunk and the newest forming the outer layer; 2d. such as grow internally; their wood, instead of circling around the first formed substance, being pushed outward by the developement of new fibres in the centre of the stem.* The first kind of stems, or such as grow externally, may be seen in the oak and other forest trees in this climate; and also in most of our common herbaceous plants; these spring from seeds of a peculiar kind called *dicotyledonous.* The second kind of stem, or such as grow internally, is found in plants proceeding from seeds called *monocotyledonous.*

Fig. 11.

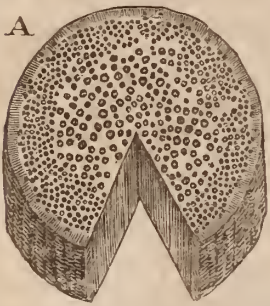

Fig. 11. A, may give you an idea of a monocotyledonous (*endogenous*) stem; you will, by comparing it with a woody stem (see plate IX.) observe the difference of structure; in the former there are no concentric layers, or vessels of different kinds but the structure is homogeneous, consisting of the longitudinal fibres which are represented by small dots; the bark does not, like that of the stems of dicotyledonous plants, consist of its own peculiar set of vessels, but seems not separate by any distinct division from the rest of the stem; this kind of stem is destitute of a proper bark.

LECTURE VIII.

Of Buds.

Most leaves and flowers proceed from scaly coverings called buds. The scales envelope each other closely; the exterior ones being dry and hard, the interior, moist and covered with down; they are also furnished with a kind of resin or balsam, which prevents the embryo from being injured by too much moisture: and have been known to lie for years in water without injury to the infant plant or branch within.

Linnæus supposed that buds derive their origin from the pith of the vegetable; as this was found necessary to their formation and growth; they appear at the axils of leaves, or at the extremities of branches and stems. The bud is a protuberance formed by a new shoot; and as, for this formation, an additional quantity of sap is needed, the reason for its appearing at the intersection of the leaf, or leaf stalk with the stem, is apparent; the sap in ascending from the root meets with some obstacles at those points, and thus accumulating, forms buds.

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* These two kinds of stem have by some French botanists been called *Endogenous* and *exogenous*; these words are derived from the Greek; the first signifying to *grow within*, the second to *grow without.*

If you plant a slip of Geranium, you will observe that it either sprouts from the axil of a leaf, or from knots in the stem which answer the same purpose as the leaf, by slightly interrupting the circulation of the juices, and thus affording an accumulation of sap necessary for the production of a new shoot.

The part of a plant which sends out new shoots, is called the *eye;* and sometimes the *germ* from its peculiar importance. Some botanists distinguish the bud as follows: that point in the plant which gives rise to the bud is called the *eye;* when this begins to swell and become apparent, the *button;* and when it begins to unfold, the *bud.*

Herbs and shrubs have buds, but these usually grow and unfold themselves in the same season, and are destitute of scales; while the buds of trees are not perfected in less than two seasons, and in some cases they require years for their full development. You have, no doubt, observed in the spring, the rapid growth of the leaves and branches of trees; and perhaps, have also noticed, that as summer advances, the progress of vegetation seems almost to cease, and that new leaves and branches do not come forth as before; but you may not have known, that instead of resting in her operations, nature is now busy in providing for the next year; that she is turning the vital energies of the plants to the formation of buds. Those little embryo plants so nicely wrapped up in downy scales as to be able to bear the coldness of winter, in the ensuing spring will come forth from their snug retreats, and taking the places of the leaves which had withered in autumn, delight us with new verdure and beauty.

The poet Cowper has the following lines on the formation of buds; they evince that character of piety which distinguishes this excellent man, in all his writings:

"When all this uniform uncoloured scene,
Shall be dismantled of its fleecy load,
And flush into variety again,
From dearth to plenty, and from death to life,

Supposed to originate from the pith—Sap needed for its formation—The eye, button and bud—Herbs and shrubs destitute of scaly buds—Period in which the formation of buds commences.

> Is Nature's progress, when she lectures man
> In heavenly truth; evincing, as she makes
> The grand transition, that there lives and works
> A soul in all things, and that soul is God.
> He sets the bright procession on its way,
> And marshals all the order of the year;
> He marks the bounds which winter may not pass,
> And blunts his pointed fury; in its *case*,
> *Russet and rude, folds up the tender germ,*
> Uninjured, with inimitable art;
> And ere one flowery season fades and dies,
> Designs the blooming wonders of the next."

Fig. 12.

You may here see a representation (Fig. 12.) of two scaly buds; one of which appears as if cut vertically, in order to show the germ or embryo which is enfolded by the scales.

Some French botanists* have explained the formation of the scaly covering of buds in a manner somewhat different from the generally received opinion. They suppose that the bud does indeed begin its existence in the latter part of summer, the *eye* being then formed; that it exists in this state during the winter, but being acted upon by some change of the temperature, it begins to force its way through the bark into the atmosphere; here the young leaves which would put forth, becoming chilled by an ungenial atmosphere, contract and harden, and at length form scales. These scales afterwards protect the new leaves, that, urged by the same vegetable instinct are in their turn, seeking to emerge into light and air. If we admit this explanation with respect to the formation of scales, it seems not difficult to account for that of the downy substance, which, lining these scales, protects the embryo leaves and flowers from cold; and the covering of varnish, which defends them from moisture.

When the leaf becomes a scale, it then absorbs from the sap but a portion of what was destined for its use, and it is supposed that this sap is converted into the resinous substance, or varnish. With respect to the downy coat upon the inside of the scales, this may be seen in the rudiments of the leaves, if examined before the bud is developed.

These hypotheses do not, if correct, in any degree derogate from the wisdom of Him, of whom Cowper says "that with art inimitable, he folds up the tender germ;" for whether he acts by secondary causes, or speaks and it is done, the design is alike apparent.

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* De Candolle, and some others.

Opinion of some botanists with respect to the formation of the scaly covering of buds—These hypotheses if admitted, do not derogate from the wisdom of the Creator.

The term bud, in common language, extends to the rudiments of all plants, whether having scales or without, which originate upon other living plants. Buds with scales are chiefly confined to the trees of cold countries. In the northern part of the United States, there are few trees which can endure the cold weather, without this security.

In Sweden, it is said, there is but one shrub* destitute of buds, and this from the peculiarity of its situation, is always protected from the inclemencies of the weather.

It appears that no perennial plants, but those furnished with scaly buds, can live in climates where it snows a part of the year; the trees of the torrid zone, the wood of which appears hard and firm, perish in our climate. In warm climates the buds of the trees are without scales, as the tender shoots do not need their protection.

That there is, in reality, a difference in the nature of vegetables, as well as animals, is very apparent; an orange tree will never form scales to protect its buds from cold, any more than the most delicate tropical animals can resist the rigors of a polar climate. There are cases however in which plants, as well as animals, change their habits. The horse-chesnut, in India, its native climate, unfolds its leaves to the atmosphere, without their receiving any check in their developement; in a colder climate, the leaves in attempting to unfold, are checked in their progress, and degenerate into scales, and form buds.

Some botanists enumerate four kinds of buds. 1st. the *bulb;* 2d. the *bulbille;* 3d. the *turion*, or little bulb; and 4th. the proper bud.

We have already considered the first kind, or the bulb, under the head of roots, where their description seems to be properly placed.

The second kind, or the bulbille, is often found in the axils of leaves, as was represented by the bulb-bearing stem in the description of stems.

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* A species of *Rhamnus*, which grows under trees, in marshy forests.

The term bud, how extensive in its application—Scaly buds chiefly confined to cold countries—Difference in the nature of vegetables—Plants sometimes change their habits; example, the Horse-chesnut—Different kinds of buds—1st. Bulb—2d. Bulbille—3d. Turion—4th. Proper bud—How divided?

Fig. 13.

The third kind of bud, is the turion; it differs but little except in size from the bulb; it appears upon roots of perennial plants, as may be seen in *Fig.* 13. *a.*

Of the fourth kind or the proper *bud*, there are three sorts;

1st. *The flower bud*, which is of a short round form; it contains the rudiments of one or several flowers, without leaves, folded over each and surrounded with scales. It is often found at the extremities of small short branches; this is the kind of bud which is employed in grafting or innoculating. This operation is performed by cutting into the bark of another tree, and placing a bud or several buds in the aperture.

2nd. *The* leaf *bud*, contains the rudiments of several leaves without flowers; it is usually longer and more pointed than the flower bud.

3d. *The bud and Flower bud, or the mixed bud*; containing both leaves and flowers. In the peach we have examples of the two first divisions; the leaf and flower bud being distinct. In the lilac they are enclosed together in the same bud.

The leaf buds, if taken from the tree and planted in the earth, will grow and put forth roots; but the flower buds in the same situation will perish. You will perceive that a striking analogy exists between buds and seeds.

You have now seen the manner in which buds commence their existence; and how they gradually unfold themselves until they become in their turn branches, covered with leaves and flowers.

In considering this subject you cannot but have been impressed with a sense of the goodness of that great Being who watches with unceasing care, over his vast creation. To watch the progress of life, whether in the vegetable or animal kingdoms, is highly interesting to an investigating mind; but here the power of man can achieve nothing; he may plant and water, but God alone giveth the increase.

A bud lives, an infant lives; both are destined to grow, and to pass through physical changes; but the bud although active, with a principle of life, knows not its own existence; while the infant becomes conscious of its own powers and faculties, capable of loving those who have contributed to its well being, and especially of adoring the great author of its existence.

Reflections suggested by a view of the subject—A bud compared to an infant.

It is delightful, while gratifying our natural love of knowledge, by inquiring into the economy of nature, to be thus met at every step, with new proofs of the goodness and wisdom of the Author of Nature, particularly as manifested towards the human race. To discover the character of the Deity, should indeed, be the end and aim of all knowledge; and even should an occasional digression from the subject of your present study, retard your progress in botanical investigations, the loss would be slight, compared to the gain of one pious and devout aspiration of the heart.

When we become so deeply engaged in philosophical speculations, as to forget Him whose works we study, we have wandered far from the path of true knowledge. It was not thus that Newton studied the laws of matter, or Lock and Watts the laws of mind, or Paley the animal and vegetable physiology; these great and good men, made their rich treasures of knowledge subservient to one great design, that of illustrating the character of God, and teaching us our duty to Him.

LECTURE IX.

Of leaves.

You all know what is meant by the leaf of a vegetable; but were you called on to give a definition to the term leaf, you might find it more difficult than at first you would imagine. Young persons are often disconcerted, when asked by their teachers to explain some word of which they have an idea, and yet find themselves unable to give a definition; but although the pupil may be surprised at this fact, it is not unaccountable to those who know, that although we may have the picture of an object in the mind, it is not always easy to convey our conceptions to the minds of others. To give correct definitions of terms, is one of the greatest difficulties in science. The manner in which different persons describe objects, varies with the degree of knowledge possessed respecting their properties. For example; in attempting to describe common salt, if a person knew nothing more of it than his unassisted senses had informed him, he would speak of its colour, taste, and other obvious

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The goodness of God particularly manifested towards the human race —Philosophical speculations should not lead us to forget the Author of nature.

Difficulty of giving a definition of a leaf—To give correct definitions one of the greatest difficulties in science.

properties: one familiar with the principles of chemistry, would first speak of the materials which compose salt; he would describe it as a compound substance, consisting of chlorine and sodium; and then might enumerate its properties. In the first definition, given without any reference to scientific principles, there is nothing so definite as to afford a certain mark of distinction between salt and other substances; in the chemical definition, we have a test for salt in a knowledge of its composition, which distinguishes it from all other substances.

In botanical definitions, we do not include the constituent elements of the vegetable substance; this belongs to the department of chemistry, but we consider the external forms and uses of the various parts of the plant.

Leaves proceed from buds and seeds; they are so various in appearance, that it is very difficult to give any one description which may apply to all.

The leaf is generally a thin, flat organ, consisting of an expansion of the fibres of the bark connected by a substance which is called the cellular tissue; the whole is covered with a green coat or skin called the cuticle. Leaves are furnished with pores* for exhaling and inhaling gases; and as they present to the air a more extended surface than all other parts of a plant, they are of great utility to the vegetable, by imbibing suitable nourishment, and throwing off such gases as would be useless or injurious.

We have seen how the bud is formed, and by what curious means the principle of vegetable life which it contains is preserved and protected through the cold and dampnesss of winter. In the spring, when the sun having performed his journey to the southern tropic, has turned his course towards the north, recrossed the equator, and is advancing towards the tropic of Cancer, the vegetable world, which had for months lain dormant, begins to awaken; the leaf buds expand, and soon bursting their envelopes, the green leaves come forth. The manner in which the leaf, before it expands, lies wrapped up in the scales of the bud, is called *Foliation*; this presents an interesting study, and is said to be sufficiently various, in different families of plants, to afford a mark of distinction between them.

In the buds of grasses the leaves are said to be *rolled* together; in the rose, one side of the leaf is *doubled* upon the stem; in the maple, the leaves are *plaited* or folded up like a fan; in the blue bell, *imbricated*, or laid over one another like tiles on the

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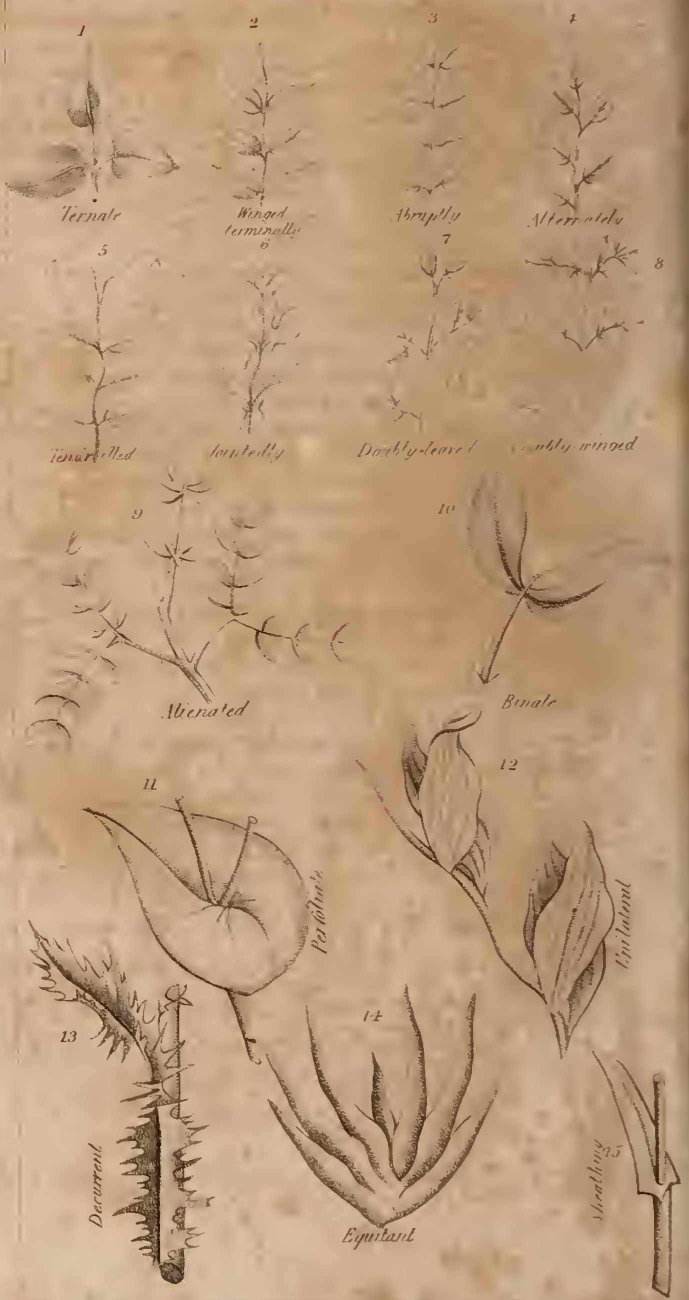
* Technically called *stomas.*

Origin of leaves—General description of a leaf—Utility of leaves to the whole plant—The period at which leaves appear—Foliation.


1
Ternate
2
Winged terminally
3
Abruptly
4
Alternately
5
Tendrilled
6
Jointedly
7
Doubly-leaved
8
Doubly-winged
9
Alienated
10
Binate
11
Perfoliate
12
Unilateral
13
Decurrent
14
Equitant
15
Sheathing

Miss Lee del.

roof of a house; in the monk's hood they are *bent downwards* towards the petiole.

Some plants are destitute of leaves; they are then called *Aphyllous*, which term signifies *wanting leaves.*

In determining the species of plants, the leaves are much regarded; specific names are often given from some circumstance of the leaf, for example; the HEPATICA *triloba* is that species of the Hepatica, which has leaves with three divisions called lobes; the VIOLA *rotundifolia* is a species of violet with round leaves.

A knowledge of the various appearances presented by leaves, is of great importance; in order to become acquainted with all their varieties, considerablo practice in the analysis of plants is necessary. Plates will assist you in understanding the definitions, but you must chiefly consult nature. There are many terms to express the varieties observable in leaves; we shall here explain some of the most important.

1st. *Leaves considered with regard to the manner in which they succeed each other in different stages of the plant.*

1. *Seminal*, leaves which come up with the plant when it first appears above the surface of the earth: as in the garden bean; these leaves are only the cotyledons or sides of the seed, which, after nourishing the young plant, decay.
2. *Primordial*, leaves growing immediately after the seminal leaves, and resembling them in position, form, and size. The primordial leaf, according to the fanciful idea of a French botanist, is a sketch which nature makes before the perfection of her work.
3. *Characteristic*, leaves are those which are found in the mature state of the plant; or according to the idea above advanced, nature in them perfects her design.

It is not always, however, that this process with regard to change of leaves takes place; as in many cases the proper, or characteristic leaf, is the only one which appears.

Leaves, with respect to *insertion*, are,

Radical, (from Radix, the root,) springing from the root, as the Dandelion.

Cauline, (from Caulis, the stem,) growing out of the stem.

Floral, growing near to the flower, sometimes called *bracts.*

Peltate, when the foot stalk, or petiole, is inserted into the middle of a leaf, like the arm of a man holding a shield.

Amplexicaul, leaves clasping the stem with their base.

Connate, united at their base.

Perfoliate, when the stem passes through the leaf.

Imbricate, lying one over another, like the shingles of a house.

Aphyllous—Leaves furnish specific characters—Leaves with respect to succession—Insertion.

Leaves with respect to *situation* and *position*, are,

Alternate, growing on different parts of the stem, observing equal distances.

Opposite, growing on opposite parts of the stem.

Decussate, crossing each other alternately in pairs.

Verticillate, whorled or stellate growing in a circle round the stem.

Fascicled, growing in a kind of bunch together.

Crowned, a tuft of leaves at the summit of the stem.

Appressed, when the leaf takes a direction parallel to the stem, and touches it in its whole direction.

Reclinate, inclining downwards.

Recurved, curved backwards.

Inflexed, curved inwards.

Resupinate, upper surface turned downwards.

Natant, swimming on the surface of the water.

Submersed, plunged under water.

Emerged, raised above water.

Leaves, with respect to *form*, are,

Simple, undivided, as in the Lily.

Compound, when several leaves grow on one petiole, as in the Rose.

The leafets of compound leaves are like the simple leaves, distinguished by their peculiar form.

Orbicular, or round leaves, are seldom seen ; if they are nearly round, they are said to be *Sub-orbicular—See plate V.*

Ovate, the shape of an egg cut lengthwise, the base being rounder and broader than the extremity.—*See plate V.*

Obovate, with the narrowest end towards the stem.

Oval, an oval leaf, with both ends of the same breadth.—*See plate V.*

Oblong, the length about three or four times more than the breadth. *See plate V.*

Spatulate, of a roundish figure, tapering into an oblong base.

Lanceolate, long and tapering, like an ancient lance.—*See plate V.*

Linear, narrow, nearly of the same width through the whole length, like many of the grasses.—*See plate V.*

Subulate, or awl form, narrow and curved at the point like a shoe maker's awl.

Angled, having corners, the exact number not being determined.

Triangular, or Deltoid, having three angles.—*See plate V.*

Rhomboid, or Diamond-shape, having four angles.

Leaves, with respect to *composition*, are,

Digitate, like fingers, when several leafets arise from the summit of a simple petiole ; as in the Horse Chesnut.

Binate, or Conjugate, when the number of leafets is two.

Ternate, when the number is three.

Pinnate, when several leafets arise from the side of a petiole : as in the Rose and Locust.—*See plate V.*

The *Summit* of leaves may be,

Acute, as in the willow, or,

Acuminate, which is still more slender and pointed.

Obtuse, when it is blunt or rounded.

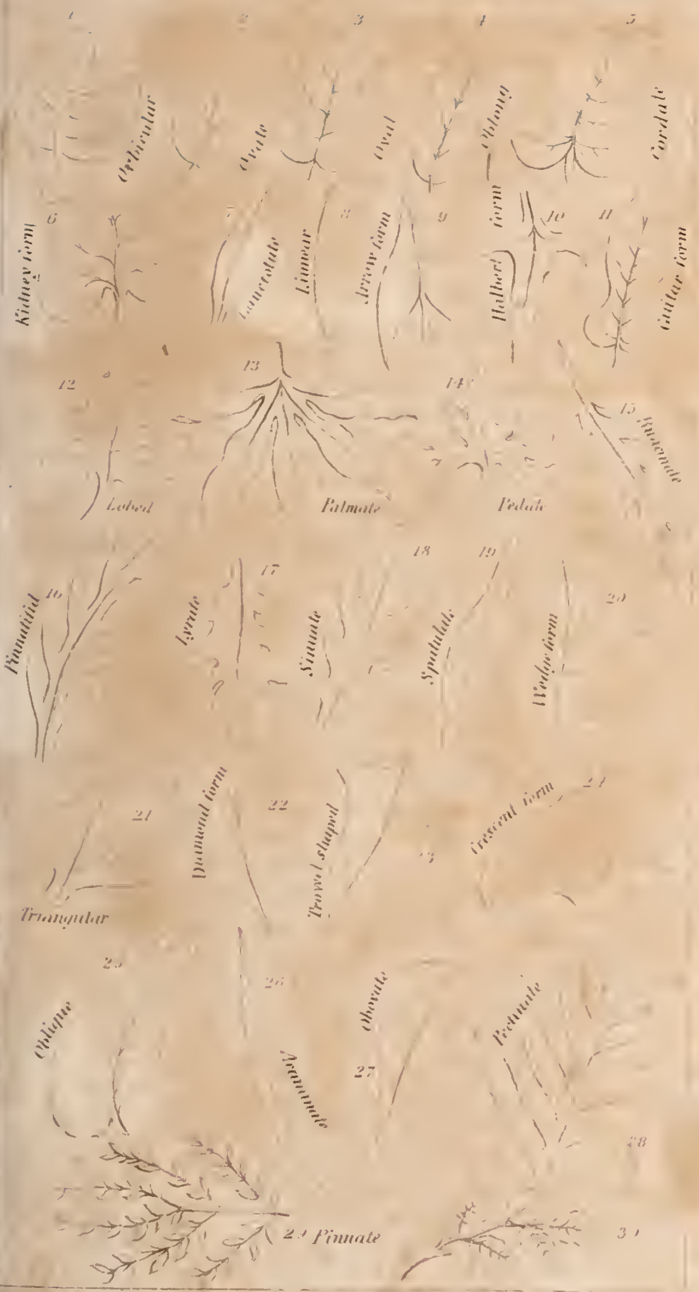
Mucronate, when the extremity of a leaf has a sharp point like a bristle.

Truncate, when the leaf seems to have been cut off.

The *Margins* of leaves, are,

Form—Composition—Summit—Margins.

PLATE V.


1
Kidney form
2
Orbicular
3
Ovate
4
Oval
5
Oblong
Cordate
6
7
Lanceolate
8
Linear
Arrow form
9
Halbert form
10
11
Guitar form
12
Lobed
13
Palmate
14
Pedate
15
Runcinate
16
Pinnatifid
17
Lyrate
Sinuate
18
19
Spatulate
20
Wedge form
21
Triangular
Diamond form
22
Trowel shaped
23
Crescent form
24
25
Oblique
26
Acuminate
Obovate
27
Pectinate
28
29 Pinnate
30

Entire, when the margin has no teeth or notches of any kind, as in the Lily.

Spinose, or prickly, as in the Thistle.

Ciliate, or fringed with hairs.

Dentate, having teeth.

Serrate, having teeth like a saw, all pointing towards the summit of the leaf.

The *Surfaces* of leaves are also very different, they are,

Hairy, having distinct strait hairs.

Downy, covered with fine cotton-like down.

Silky, covered with soft close-pressed hairs.

Bristly, having stiff hairs.

Nerved, fibres running from the base to the point.

Veined, having fibres variously branched.

Punctate, or dotted, appearing, when held to the light, as if pricked with a pin.

Plaited, folded like a fan.

Coloured, this term is applied to all leaves that are not green, as the Beet.

LEAVES WITH RESPECT TO MAGNITUDE.

Leaves vary in size, from the small leaves of some of the forest-trees of our climate, to the spreading Palms and Bananas of the torrid zone. As we approach the torrid zone, the leaves increase in magnitude; we can, however, scarcely credit the reports of travellers, who say, that the Talipot tree, in the Island of Ceylon, produces leaves of such size, that twenty persons may be sheltered by one single leaf. Although this account may be exaggerated, there is no doubt of the general fact, that the leaves of the torrid zone are of a wonderful size; and that whole families can make their habitations under the branches of these trees. Here we see the care of that ever kind providence, which, in countries parched the greater part of the year by a vertical sun, has formed such refreshing shelters.

Mungo Park, in his travels in Africa, remarks upon the many important uses of palm leaves; serving as coverings to cottages, as baskets for holding fruit, and umbrellas for defence against rain or sun. These leaves are a good substitute for paper, and were by the eastern nations so used. Many suppose that the scriptures of the Old Testament were originally committed to palm leaves.

The magnitude of leaves often bears no proportion to the size of the plants to which they belong. The oak, and other forest trees, bear leaves, which appear very diminutive when compared with the cabbage, or burdock.

Leaves, with respect to *Duration*, are,

Surfaces—Magnitude—Palm-leaves—Leaves not corresponding in magnitude to the size of the plant—Duration.

Caducous, such as fall before the end of summer.

Deciduous, falling at the commencement of winter, this is the case with most vegetables, as far as 30° or 40° from the equator.

Persistent, or permanent, remaining on the trees amidst the changes of temperature: as the leaves of the pine and box.

Evergreen, preserving their greenness through the year; as the fir-tree and pine, and generally all cone-bearing and resinous trees; these change their leaves annually, but the young leaves appearing before the old ones decay, the plant is always green.

In our climate the leaves are mostly deciduous, returning in the autumn to their original dust, and enriching the soil from which they had derived their nourishment. In the regions of the torrid zone, the leaves are mostly persistent and evergreen; they seldom fade or decay in a less time than six years; but these same trees, removed to our climate, sometimes become annual plants, losing their foliage every year. The Passion flower is an evergreen in a more southern climate.

Leaves with respect to *Colour.*

Leaves have not that brilliancy of colour which is seen in the corolla or blossom; but the beauty of the corolla, like most other external beauty, has but a transient existence; while the less showy leaf remains fresh and verdant, after the flower has withered away.

The substance of leaves is so constituted as to absorb all the rays of light, except *green*; this colour, is, of all others, best adapted to the extreme sensibility of our organs of sight. Thus, in evident accommodation to our sense of vision, the ordinary dress of nature is of the only colour upon which our eyes can for any length of time rest without pain.

But although green is almost the only colour which leaves reflect, their variety of shades is almost innumerable.

> "No tree in all the grove but has its charms,
> Though each its *hue* peculiar; *paler* some,
> And of a *wannish grey*; the willow such,
> And poplar, that with silver lines his leaf;
> And ash far stretching his umbrageous arm:
> Of *deeper green* the elm; and *deeper* still,
> Lord of the woods, the long surviving oak."*

The contrast between their shades, in forests, where different families of trees are grouped together, has a fine effect, when observed at such a distance, as to give a view of the whole as forming one mass.

* *Cowper.*

Colour—Why they are mostly green—Different shades in plants, to what owing?

A small quantity of iron, united to oxygen in the vegetable substance, and acted upon by rays of light, is said to give rise to the various colours of plants.* If this theory is correct, the different shades of colour in plants, must be owing to the different proportions in which the iron and oxygen are combined.

To quote the words of a celebrated Chemist, "When Nature takes her pencil, iron is the colouring she uses."

LECTURE X.

Anatomy of Leaves.—Their use in the Vegetable System.—Appendages to plants.

Leaves are compared to the lungs of animals; they are organs for *respiring*, *perspiring*, and *absorbing.* When leaves are wanting, as in the Prickly Pear, (*Cactus*,) the green surface of the stem appears to perform the office of leaves. If you will observe a dead leaf which has for some time been exposed to the action of the atmosphere, you may see the *skeleton, or frame work* of the leaf; (see plate IX.) this consists of various fibres, minutely subdivided, which originate from the petiole. This skeleton of the leaf may be examined to advantage, after boiling the leaves slightly, or rubbing them in water; the *cuticle* or skin easily separates, and the pulp may then be washed out from between the meshes of the veined net-work; thus the most minute cords of the different vessels become perceptible, with their various divisions and subdivisions; this forms what is called the *vascular* system.

It would be extending our researches beyond our proper limits, to attempt to follow the writers who have remarked upon the peculiar offices of these organs. In external appearance, they are analogous to the bones which constitute the foundation of the animal system, but they are considered as performing the office of veins or arteries. They are found to be tubes; in some cases, this is ascertained by the naked eye; in others, beautifully illustrated by immersing the fibres of the leaf in some coloured liquid; on taking it out, they are found to contain internally a portion of the liquid; this experiment proves them to be both *tubular* and *transparent.*

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* This idea coincides with the supposition, that the green colour of leaves is changed to brown by the loss of an acid principle; that when the petals of flowers turn from purple to red, they have an increase of an acid. The base of this acid is *oxygen.*

Leaves, their use—Skeleton of the leaf—Vascular system—Found to be tubular and transparent.

The covering of this frame-work of the leaf is first, a pulpy substance, called the *parenchyma* or *cellular* tissue. Some leaves contain much more of this than others, of course they are more pulpy and juicy; it is found, as its name *cellular* would denote, to consist of a mass of little cells, various in size in different leaves; in some, with the most powerful magnifiers, the cells are scarcely perceptible; in others, they may be seen with the naked eye. These cells are of important use, in the secretion and communication of substances through the leaf; and may thus be considered as a kind of glands, having a communication with the vascular system.

The covering of the leaf, is called the *cuticle* or *epidermis;* this guards the vascular system and cellular tissue from injury, and is the medium, by which the leaf performs the important functions of absorbing nourishment, and throwing off such substances as are useless or hurtful. The cuticle is sometimes covered with downy or hairy glands, which seem to afford security against changes of weather; such plants are capable of enduring a greater degree of heat than others. In some cases the cuticle is covered with a transparent varnish, that is very important, preserving the plant from injury by too much moisture, adding also to its beauty. The trees of Abyssinia and some other countries, which are subject to long rains, and continued moisture, are thus shielded from the injurious effects of the weather.

Some of the uses of Leaves.

Leaves perform a very important office, in sheltering and protecting the flowers and fruit; the fact of their inhaling or absorbing air, is thought to have been proved, by placing a plant under an exhausted receiver, permitting the *leaves only* to receive the influence of air; the plant remained thrifty in this situation for a length of time; but as soon as the whole plant was placed under the receiver, it withered and died.*

The upper surface of leaves, usually of a deeper green, is supposed to perform a more important part in respiration, than the under surface. The upper surface is also thought to repel moisture; as you may perceive upon a cabbage leaf after a shower, or heavy dew, that the moisture is collected in drops, but has no appearanee of being absorbed by the leaf. It has been found that the leaves of plants, laid with their upper surface upon the water, wither almost as soon, as if exposed to the air; although the leaves of the same plant, placed with their under surfaces upon the water, retain their freshness for some days. But few among the vegetable tribes are destitute of leaves, or green stems, which answer as a substitute. The *Monotropa*, or Indian pipe, is of a pure white, as if made of wax; the mushrooms are also destitute of any green herbage. It is not known in what manner the deficiency of leaves is made up to these vegetables.

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*I give this experiment on the authority of Barton; but although the respiration of leaves seems not to be doubted, this experiment may not be thought a fair one; for it would seem very difficult, to place a plant under a receiver, with the leaves exposed to the air, without at the same time admitting any air into the receiver.

Cellular tissue—Cuticle—Leaves inhale air—Upper surface.—

The period in which any species of plant unfolds its leaves, is termed its *Frondescence.* Linnæus paid much attention to this subject; he stated as the result of his investigations that the opening of the leaf buds of the Birch tree, (Betula,) was the most proper time for the sowing of barley. The Indians of our country had an opinion, that the best time for planting Indian corn, was when the leaves of the White Oak, (QUERCUS *alba*,) first make their appearance; or according to their expression, are of the size of a squirrel's ears.

One of the most remarkable phenomena of leaves, is their *irritability*, or power of contraction, upon coming in contact with other substances. Compound leaves possess this property in the greatest degree; as the sensitive plant MIMOSA *sensitiva:* and the American sensitive plant, CASSIA *nictitans:* these plants on holding the hand near them, exhibit agitation, yet as they are destitute of intelligence, we must attribute this phenomenon to a physical cause; this cause is probably the warmth of the hand, which in some manner not understood by us, produces the contractions, and dilatations of the leaves.

The *effect of light* upon leaves is very apparent, as plants are almost uniformly found to present their upper surfaces to the side on which the greatest quantity of light is to be found. It has already been observed that plants throw off oxygen gas; but for this purpose they require the agency of light. Oxygen exists in plants united with carbon, forming carbonic acid gas; by the agency of light, the oxygen is separated from the carbon, the latter is incorporated into the substance of the vegetable, while the former is exhaled by the leaves.

Many plants close their leaves at a certain period of the day, and open them at another regular period; almost every garden contains some plants, in which this phenomenon may be observed; it is particularly remarkable in the sensitive plant, and the tamarind tree. This folding up of the leaves at particular periods, has been termed *the sleep* of plants; it may seem a singular term to apply to plants; but a celebrated botanist* remarks, "this folding up of the leaves may be as useful to the

* Sir J. E. Smith.

Few plants destitute of leaves—Frondescence—Irritability—Effect of light—Sleep of plants.

vegetable constitution, as real sleep is to the animal." Linnæus was led to observe the appearance of plants in the night, from a circumstance which occurred in raising the Lotus plant; he found one morning some very thrifty flowers, but at night they had disappeared; this excited his attention, and he began to watch the plants through the night, in order to observe the period of their unfolding. He was thus led to investigate the appearance of other plants in the night, and to observe their different manner of sleep; some folding their leaves together, others throwing them back upon their stems, and exhibiting a variety of appearances. This phenomenon has been attributed to the absence of light. A curious experiment has been made by another botanist, who placed the sensitive plant in a dark cave, at midnight, and then lighted up the cave with lamps; the leaves which were before folded up, suddenly expanded, and when on the following day the lights were extinguished, the leaves again closed.

The period at which the leaves fall off is termed the *Defoliation** of the plant; about the middle of autumn, the leaves of all annual, and of many perennial plants, gradually lose their vigour, change their colour, and at length fall from their stems.

The "fall of the leaf" may be referred to two causes; the *death* of the leaf, and the *vital action of the parts to which it is attached.* If a whole tree is killed by lightning, or any sudden cause, the leaves will adhere to the dead branches, the latter not having the energy to cast them off. The richness and variety of colouring exhibited about the end of autumn, by our groves and forests, is splendid beyond the power of the painter to imitate. Yellow, red, and brown, are the most common colours of the dying leaf; but these colours vary from the brightest scarlet, and the deepest crimson, intermixed with every shade of yellow, from the deep orange, to the pale straw colour.

Although we have said considerable upon leaves, yet we have merely touched upon the most important circumstances with respect to them. You will, perhaps, be induced to pay more attention than formerly to them, in their different stages; from their situation in the bud, to their full growth and perfection; and will feel a new interest in their change of colour, when you understand something of the philosophy of this change; even the dry skeletons of leaves, which the blasts of autumn strew around us, may not only afford a direct moral lesson, but, inducing you to examine their structure, lead you to admire and adore the power which formed them.

* Or depriving of leaves.

Defoliation—Fall of the leaf—Concluding remark.

APPENDAGES TO PLANTS.

Plants have a set of organs, the uses of which are less apparent than those we have been considering; but we should not infer, because the design for which they have been formed, is in some measure concealed from us, that they were made for no purpose, or exist by mere accident; let us rather with humility, acknowledge that this blindness must be owing to the limited nature of our own faculties. It would be impious for us to imagine, that all the works of God which we cannot comprehend, are useless.

The organs to which we now refer are called by the general name of appendages; they consist of *seven* different kinds, *Stipules*, *Prickles*, *Thorns*, *Glands*, *Stings*, *Scales*, *Tendrils*, *Pubescence*, *and Bracts.*

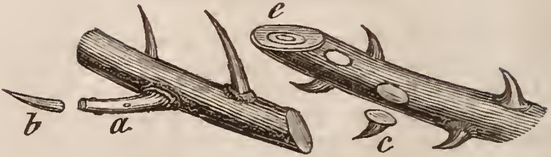
1st. *Stipules*, are membranous or leafy scales, usually in pairs, at or near the base of the leaf or petiole. The stipules furnish characters used in botanical distinctions. They are various in their forms and situations, found in most plants, but sometimes wanting. In the garden violet, VIOLA TRICOLOR the stipules are of that form called *lyrate pinnatifid*, while the true leaf is oblong and crenate. The most natural situation of the stipules is in pairs, one on each side of the base of the footstalk, as in the sweet pea; some stipules fall off almost as soon as the leaves are expanded, but in general, they remain as long as the leaves.

2d. *Prickles*, arise from the bark or cuticle, they are sometimes straight, sometimes hooked, and sometimes forked. They are usually found upon the stems, as in the rose; but in some cases, they cover the petiole, as in the raspberry; in others, they are found upon the leaf or the calyx, and in some instances, upon the berry; as in the gooseberry.

3d. *Thorns*, seem to be a kind of short pointed stem, easily distinguished from prickles, as they grow from the woody part of the plant, while the prickle proceeds only from the bark. On stripping the bark from a rose bush, the prickles will come away with it, but let the same experiment be made with a thorn bush, and although the bark may be separated, the thorn will still remain projecting from the wood.

Organs whose uses are less apparent—Observation—Different kinds of appendages—Stipules—Prickles— Thorns—Difference between the thorn and the prickle.

Fig. 14.



In this drawing (fig. 14,) you will observe the thorn (*a*) to remain on the stem while the bark (*b*) has been peeled off. In the prickle (*c*) the whole appears separated from the plant. The thorns in some plants have been known to disappear by cultivation. The great Linnæus imagined that in such cases, the trees were divested of their natural ferocity and became tame. You may smile at such a strange idea, but even great minds have their weaknesses; when persons become enthusiastic in any science, they are in danger of fancying analogies or resemblances, which exist only in their own minds. A more rational opinion is given by another botanist, viz—that thorns are in reality buds, which a more favourable situation converts into luxuriant branches. But in some cases thorns do not disappear even under circumstances favourable to vegetation. They have been compared to the horns of animals.

4th. *Glands*, roundish minute appendages, sometimes called tumours or swellings; they contain a liquid secretion which is supposed to give to many plants their fragrance. They are sometimes attached to the base of the leaf, sometimes, they occur in the substance of leaves; as in the lemon and myrtle, causing them to appear dotted when held to the light. They are found on the petioles of the passion flower, and between the teeth or notches of the leaves of many plants.

5th. *Stings*, hair-like substances, causing pain by an acrid liquor, which is discharged upon their being compressed; they are hollow, slender, and pointed, as in the nettle.

6th. *Scales*, substances, in some respects resembling the coarse scales of a fish; they are often green, sometimes coloured, and are found upon all parts of vegetables, upon the roots of bulbous plants, and upon the stems and branches of other plants. They are imbricated upon the calyxes of most of the compound flowers. You have seen in buds, how important the scales are to protect the embryo plant during the winter. Scales surround the flowers of grasses, under

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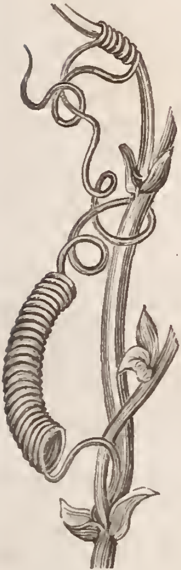
Thorns in some cases made to disappear—Glands—Stings—Scales.

the name of *glumes;* they envelope and sustain the stamens and fruit* of the pine, oak, chesnut, &c.

Fig. 15.



7th. *Tendrils,* or claspers, thread-like or filiform appendages, by which weak stems attach themselves to other bodies for support; they usually rise from the branches, in some cases from the leaf, and rarely from the leaf stalk or flower stalk. You have here the representation (Fig. 15.) of a tendril. Tendrils are very important, and are characteristic appendages to many plants. In the trumpet flower and ivy, the tendrils serve for roots; planting themselves into the bark of trees, or in the walls of buildings. In the cucumber and some other plants, the tendrils serve both for sustenance and shade. Many of the papilionaceous, or pea blossom plants, have twining tendrils, which wind to the right and back again. Among vegetables which have tendrils, has been discovered that property, which some have called the instinctive intelligence of plants. A poetical botanist represents the tendrils of the gourd and cucumber, as "creeping away in disgust from the fatty fibres of the neighbouring olive." There is certainly much that is astonishing in the manner which tendrils stretch themselves forward, to grasp some substances while they shrink from others. But instead of imagining that they have a preference for some and a dislike for other objects, it is much more philosophical to conclude that these effects arise from physical causes, which may be rationally explained. It has been ascertained by experiments, that the tendrils of the vine, and some other plants recede from the light, and seek opaque bodies. The fact with respect to leaves is directly the reverse of this, for they turn themselves round to seek the light.

Some plants creep by their tendrils to a very great height even to the tops of the loftiest trees; and seem only to cease ascending because they can find nothing higher to climb. One of our most beautiful climbing plants is the

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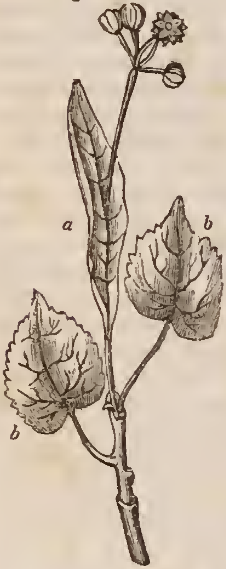
*These fruits are called aments, cones, or strobilums.

Tendrils—Recede from the light.

CLEMATIS *virginica*, or virgin's bower, which has beautiful pure white flowers.

8th. *Pubescence* includes all the down, hairs, woolliness, or silkiness of plants. The pubescence of plants varies in different soils, and with different modes of cultivation. But the species in some genera of plants are distinguished by the direction of the hairs. The microscope is sometimes necessary in determining with precision the existence and direction of the pubescence. It has been suggested that the uses of these appendages may be for similar purposes as the furs, hairs, and bristles of animals; to defend the plants from cold, and injuries from other causes.

Fig. 16.



9th. *The Bract* is a leaf among or near the flowers, different from the leaves of the plant. You may in this branch Fig. 16. observe the difference between the real leaves (*b.b.*) and the bract (*a*); the former being *cordate* and *crenate*, the latter *lanceolate* and *entire.*

In some plants as in several species of sage, the transition from leaves to bracts, is so gradual, as to render it difficult to distinguish between them, and a considerable part of the foliage, is composed of the bracts. In some plants, as the crown imperial, the stem is terminated by a number of large and conspicuous bracts. These appendages are sometimes mistaken for the calyx. Bracts are either *green* or *coloured*, *deciduous* or *persistent.* The Orchis tribe have green leaf-bracts. No plants of the class Tetradynamia have bracts.

We have now in regular order, considered the first of the two classes of vegetable organs, viz: such as tend to the support and growth of the plant including *root*, *stem*, *leaf and appendages.*

Pubescence—Bract—Difference between the real leaf and the bract—Recapitulation.

LECTURE XI.

Calyx.

We are now to consider the second division of vegetable organs, viz. such as serve for the reproduction of the plant, usually called organs of fructification. Their names were considered, when commencing the analysis of flowers; but we are now to examine them with more minute attention, and to remark upon their different uses in the vegetable economy.

You are no doubt pleased to have arrived at that part of the plant, which is the ornament of the vegetable kingdom. Flowers are delightful to every lover of nature; a boquet or even the simplest blossom, presented by a friend, interests the heart. How many pleasant thoughts are awakened by the fresh and perfumed incense which they offer. The odour of flowers has been poetically termed the language by which they hold communion with our mind. Females are usually fond of flowers; but until recently, the greater number have only viewed them as beautiful objects, delighting the senses by their odour and fragrance; but they have not been aware that these objects, lovely as they seemed, might be rendered doubly interesting, by a scientific knowledge of the relations and uses of their various parts. Even at the present period, there are those who spend years in cultivating plants, ignorant of their botanical characters, when a few hours study might unfold to them the beautiful arrangement of Linnæus, and open to their astonished minds a world of wonders.

Although every part of a plant offers an interesting subject for study, the beauty of the blossom, seems by association, to heighten the pleasure of scientific research. Flowers are indeed lovely, but like youth and beauty they are fading and transient; they are, however, destined for a higher object than a short lived admiration; for, to them, is assigned the important office of producing and nourishing the fruit: like them may you so improve the bloom of life, that when youth and beauty shall have faded away, your mind may exhibit that fruit, which it is the important business of the present season to protect and nurture.

Second division of vegetable organs—Flowers delightful—Many who cultivate them ignorant of their botanical characters—Flowers analogous to youth.

The parts of the flower, or the organs of fructification are the following,

Calyx,
Corolla,
Stamen,
Pistil,
Pericarp,
Seed,
Receptacle.

CALYX.

The Calyx is frequently wanting; as in the tulip. The corolla is also wanting in many plants; as, in most of the forest trees; these to a careful observer, may seem to produce no flower, but the presence of a stamen and pistil, is in botany, considered as constituting a *perfect flower*. These two organs are essential to the perfection of the fruit; and when a flower is destitute either of stamens or pistils, it is termed *imperfect.*

The word Calyx is derived from the Greek, and literally signifies a cup; it is the outer cover of the corolla, and usually green; when not green it is said to be *coloured.* This organ is an expansion of the bark of the peduncle or flower-stalk, as appears from its colour and texture. The calyx usually envelopes the corolla, previous to its expansion, and afterwards remains below or around its base. Sometimes the calyx consists of one leaf only, it is then called *monophyllous;* when it consists of several distinct leaves, it is called *polyphyllous;* when one calyx is surrounded by another, it is *double;* when one calyx surrounds many plants, it is *common.*

In the calyx are three parts, very distinct in calyxes which are long and cylindric; they are 1st. the *tube* which commences at the base, or the top of the peduncle; 2nd. the *throat*, above the tube; and 3d. the *mouth*, or the upper and expanded part; the tube of the calyx is *cylindric* in the pink, and *prismatic* in the stramonium.

The position of the calyx with respect to the germ, offers an important mark of distinction between different genera, and also between different natural families of plants. The calyx is said to be *superior* when it is situated on the summit of the germ, as in the apple; it is *inferior* when situated below the germ, as in the pink. In many plants the calyx is neither superior or inferior but is situated around the germ.

When the calyx drops off before the flower fully expands, it is

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Organs of fructification—Calyx, sometimes wanting—Description of the calyx—Parts of the calyx—Position with respect to the germ—Duration—

called *caducous*; the petals of the poppy are at first, enclosed in a calyx of two large green leaves, but these fall off before the flower is full blown. When the calyx withers and drops off with the corolla it is called *deciduous*. In many plants it remains until the fruit is matured; it is then called *persistent*. In a pea pod for example, the calyx may be seen as perfect as it was in the blossom. In an apple or a pear, the dried leaves of the calyx may be seen on the tops of the fruit; this shows that the calyx was superior.

According to the divisions of Linnæus there are seven kinds of calyxes; viz.

Perianth,
Involucrum,
Ament,
Spatha,
Glume,
Calyptra,
Volva.

Perianth. This term is derived from the two Greek words *peri* around; and *anthos* flower. This is the only real calyx or cup, as the term cup does not properly apply to the other kinds. A good example of the perianth calyx is presented in the rose in which it is *urn*-form, with divisions resembling small leaves at the top: in the pink the perianth is long and tubular, having the border dentate or toothed. The holly-hock, hibiscus, and many other plants have a double perianth.

The general remarks which were made upon the calyx may be considered as chiefly applicable to the perianth.

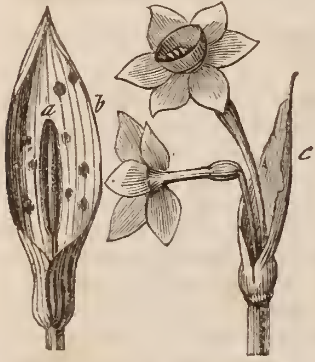
Involucrum. This term is derived from the Latin, *involvo*, to wrap up; this kind of calyx is usually found at the base of an umbel; as, in the carrot. It is said to be *universal*, when it belongs equally to the whole of an aggregate flower; and *partial* when it encloses one floret, which, with others, constitutes a compound or aggregate flower. The term involucrum is applied to the membranous covering in the fructification of germs.

Ament or *catkin.* Is a kind of calyx, by some classed as a mode of inflorescence; it consists of many chaffy scales, ranged along a thread-like stalk or receptacle; each scale protects one or more of the stamens or pistils, the whole forming one aggregate flower. The *Ament* is common in forests trees; as in the oak and chesnut; and is also found in the willow and poplar. In some trees, the staminate flowers are enclosed in an ament, and the pistillate in a perianth.

Different kinds of calyxes—Perianth—Involucrum—Ament.—

Spatha: Signifies a sheath. It is that kind of calyx which first encloses the flower, and when it expands, bursts lengthwise and often appears at some distance below it. The wild turnip or ARUM furnishes an example of this kind of calyx, enclosing with the spatha, a kind of infloresence called a *spadix.* From the peculiar appearance of the spadix, as it stands up surrounded by the spatha, it is in England vulgarly called *Jack in the pulpit.* The spatha is common in many of our cultivated exotics, as in the daffodil (NARCISSUS) when it appears brownish and withered, after the full expansion of the flower. You see here a representation (Fig. 17.) of the spatha of the Arum (*b.*) and of the Narsissus (*c*). In the Egyptian Lily, (CALLA,) the spatha is white and permanent, the stamens and pistils grow separately upon the spadix. Palms have a spadix which is branched, and often bears a great quantity of fruit.

Fig. 17.



Glume, is from the latin word *gluma* a husk. This is the calyx of the grasses, and grass like plants. In the oat, and wheat, it forms the *chaff,* a part which is thrown away as worthless. In the oat, the glume calyx is composed of two pieces or valves; in some kinds of grain, of but one, in others of more than two valves.

To the glume belongs the *awn* or beard. The corolla of grasses is husky, like the calyx, and is sometimes considered as a part of it. A French Botanist says, that there is in the grasses, neither calyx nor corolla, that these scales are only membranous bracts. He thinks, the confusion with respect to those parts has tended to render the study of grasses difficult.

Calyptra. This term is derived from the Greek, and signifies a veil. It is the, cap, or hood of pistillate mosses, resembling in form and position the extinguisher of a candle.

Volva, or curtain, the ring or wrapper of the Fungus plants. It first encloses the head of the Fungus, afterwards bursts and contracts; remaining on the stems, or at the root.

We have now considered the different kinds of calyx; we find that the calyx is not essential, since it is wanting in some plants, but its presence adds to the completeness of the flower;

Spatha—Glume—Calyhtra—Volva—Uses of the Calyx.—

and in some few cases it is the most showy part; as in the lady's-ear-drop, where it is of a bright scarlet color, and the Egyptian Lily, where it is pure white.

The calyx seems of use in protecting the other parts of the flower, before they expand; and afterwards supporting them, by keeping all in their proper position.

Pinks having petals with long and slender feet, which would drop or break without support, have a calyx. Tulips having firm petals, and each one resting upon a broad strong basis, are able to support themselves, and they have no calyx.

In some plants the calyx serves as a seed-vessel; as in the order Gymnospermia, of the class Didynamia, where there are four naked seeds lying in the bottom of the calyx.

LECTURE XII.

Corolla.

The term *corolla*, or corol is derived from the Latin *corona*, a crown or chaplet. As the calyx is formed by a continuation of the fibres of the outer bark, the corolla is a continuation of the cellular integument, or inner coat of the same. The texture of the corolla is delicate, soft, watery, and colored. It exhales carbonic acid gas, but does not give off oxygen, either in the dark, or when acted upon by light; as is the case with the green parts of plants. The cuticle or outward covering of the corolla is of an extremely fine texture. The rich and variegated colours of flowers, are owing to the delicate organization of the corolla; and to this cause, its transient duration may also be attributed.

The corolla exhibits every variety of color, except black; florists sometimes present us, with what they term, black roses, and we see some other flowers, which approach this color, yet none are perfectly black; but the darkest may be considered, as a very deep shade of purple.

Corollas are usually white, yellow, blue, violet, &c; in some, different colors are delicately shaded, and blended; in others, they meet abruptly, without any intermediate tint.

The color of the corolla, in the same species, often varies without any assignable cause: This fact is strikingly illustrated in the *Four o'clock*, (MIRABILIS,) the flowers of which are

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Not an essential organ.

Corolla—derivation of the term—a continuation of the cellular integument—description of the corolla—colour.

sometimes of a pale yellow, somtimes a bright crimson, then richly variegated. Man does not create these varieties; they are the result of circumstances unperceived by him, and not under his control; the florist watches these changes, and as far as possible, avails himself of them in the production of new beauties in the vegetable kingdom.

The corolla, before blossoming, is folded in the calyx, as the leaves are within the scales of the leaf-bud, and the whole is then called the flower bud. In most cases the calyx and corolla are so distinctly marked, that it is perfectly easy to distinguish them; the color usually constitutes a very striking mark of difference; the calyx being ordinarily green, and the corolla of a more lively hue, but the color is not always a criterion. In some cases the calyx is beautifully colored. In the FUSCHIA, (Lady's ear-drop,) the calyx is of a bright scarlet; you would, no doubt, at first think it to be the corolla; but if you remove the scarlet coat, you may see, wrapped around the eight stamens, a purple covering; on taking off each piece carefully, you will find four petals,* as distinct as the petals of a rose; you will then see that the outer covering must be the calyx.

Linnæus, made the following distinction between the corolla and the calyx, viz. that the corolla has its petals alternate with the stamens, and the calyx has its leafets arranged opposite to them. This rule is not found to be invariable; it has led some botanists to call that the corolla, which others have named the calyx. It seems as if nature had not placed any absolute limits between these two organs.

The corolla sometimes falls off soon after the flowering, as in the poppy; it is then said to be *caducous;* sometimes it fades and withers upon the stalk, as in the blue bell; it is then said to be *marescent* or withering.

Each simple part, of which the corolla is composed, is called a *petal.* A flower with petals is said to be *petalous;* without petals, it is called *apetalous.* The petals are *definite* when their number is not more than twenty; they are said to be *indefinite* when they exceed that number.

If the corolla is formed of one single piece, or petal, it is *monopetalous;* if of more than one, it is *polypetalous.* You may sometimes find a difficulty in determining whether a corolla

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* Some Botanists call these nectaries, but this seems to be making an unnecessary confusion in terms; for they have as much the appearance of petals, as those of a rose or pink.

Its situation before expanding—how distinguished from the calyx?—rule of Linnæus—duration—parts of the corolla—monopetalous—polypetalous corollas, how divided?

is in one piece or more; for monopetalous flowers often have deep divisions, extending almost to the base of the corolla; but they must be divided at the base, or be in separate pieces, in order to be considered as *polypetalous*. It is a good rule, to consider the parts into which a corolla naturally falls, as so many petals.

Monopetalous corollas, consist of the *tube*, *throat* and *limb*. The *tube* is the lower part, having more or less, the form of a tunnel. The *throat*, is the entrance into the tube; it is either open, or closed by scales or hairs. The *limb*, is the upper border of the corolla.

Polypetalous corollas, present first *different petals* which form the whole corolla. Each petal consists of two parts, the *claw* and *lamina*, (*See plate*, 1. the dissected pink.)

The claw is the lower part of the petal, and inserted upon the receptacle. It is sometimes very short, as in the rose; in the Pink it is long and slender: it is analogous to the tube of monopetalous corollas.

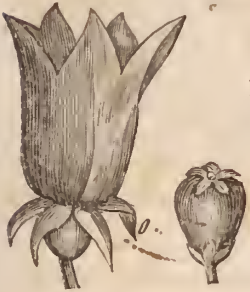
The *lamina*, is the upper, and usually the thinner part of the petal; its margin is sometimes *entire*, or without divisions, as in the rose; sometimes notched, or *crenate*, as in the pink. The lamina corresponds to the limb of monopetalous corollas.

The corolla is *superior* when it is inserted *above* the germ; *inferior*, when below. It is *regular* when each division corresponds to the other. The rose and pink have regular corollas. When the parts do not correspond with each other, a corolla is *irregular*; as in the geranium, pea, and labiate flowers.

Different forms of Monopetalous Corollas.

Monopetalous corollas may by their form, be divided as follows.

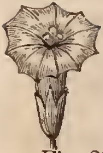
Fig. 18.



1st. *Bell-form*, Fig. 18 (*campanulate*, from *campanula*, a little bell;) the tube is not very distinct, as the corolla gradually spreads from the base; as in the blue bell, hair bell, &c.

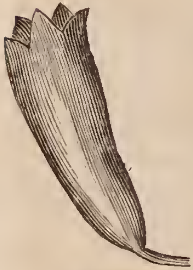
Forms of Monopetalous corollas—Bell-form—

Fig. 19.



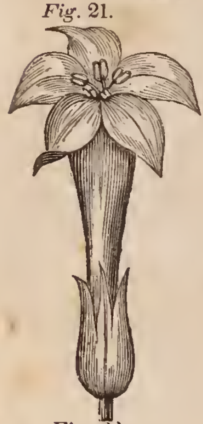
2d. *Funnel form*, Fig. 19 *infundibuliformis*, from *infundibullum*, a funnel) having a tubular base and a border opening in the form of a funnel, as the morning glory.

Fig. 20.



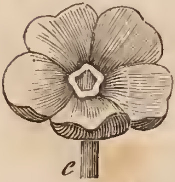
3d. *Cup shaped*, Fig. 20 (*Cyathiformis* from *cyathus* a drinking cup) differing from funnel shaped in having its tube, and of course its border less spreading; and from bell form, in not having its tube appear as if scooped out at the base.

Fig. 21.



4th. *Salver form*, Fig 21. (*hypocrateriformis* from the Greek *krater*, an ancient drinking glass, called a *Salver*.) Having a flat spreading border, proceeding from the top of a tube.

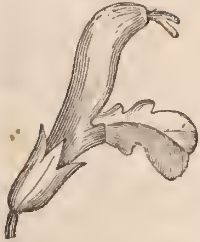
Fig. 22.



5th. *Wheel form* Fig. 22. (*rotata*, from *rota* a wheel) having a short border without any tube, or with a very short one.

Funnel-form—cup-shaped—salver-form—wheel-form—

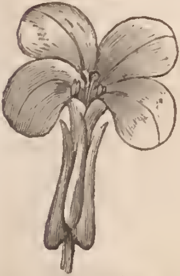
Fig. 23.



6th. *Labiate*, Fig. 23. (from labia, lips) consists of two parts resembling the lips of a horse, or other animal. Labiate corollas are said to be personate,* having the throat closed, or *ringent*† with the throat open. You have here, Fig. 23. a labiate corolla of the *ringent* kind.

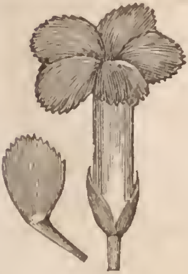
Different forms of polypetalous corollas.

Fig. 24.



1st. *Cruciform*, Fig. 24. (from *crux* a cross) consisting of four petals of equal size spreading out in the form of a cross, as the radish, cabbage, &c.

Fig. 25.



2d. *Caryophyllous*, (Fig. 25.) having five single petals, each terminating in a long claw, enclosed in a tubular calyx, as the pink.

3d. *Liliaceous*, a corolla with six petals spreading gradually from the base, so as to exhibit a bell form appearance, as in the tulip and lily.

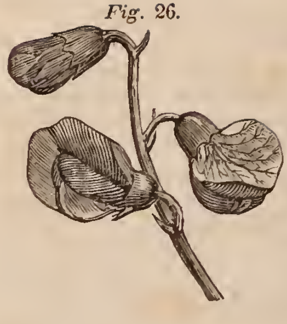
4th. *Rosaceous*, a corolla formed of roundish spreading petals, without claws, or with very short ones, as the rose and apple.

[*] From persona, a mask.

[†] From ringo, to grin or gape.

Labiate, how divided?—Forms of Polypetalous corollas—Cruciform—Caryophyllous—Liliaceous—Rosaceous.

Fig. 26.



5th. *Papilionaceous*, (Fig. 26) a flower with a banner, two wings, and a keel: the name is derived from the word *papilio*, a butterfly, on account of a supposed resemblance in form, as the pea blossom.

If a corolla, in shape, is not like any of the forms we have described, it is said to be *anomalous*, which signifies without law or rule.*

Odour of Flowers.

The odour of flowers has its origin in the volatile oils, elaborated by the corolla: its production results from causes both external and internal, but equally beyond our observation.

Temperature renders the odours of flowers more or less sensible; if the heat is powerful, it dissipates the volatile oils more rapidly than they are renewed; if the heat is very feeble, the volatile oils remain concentrated in the little cells where they were elaborated; in both cases the flowers appear to possess but little odour.

But if the heat is neither too great nor too little, the volatile oils exhale without being dissipated, forming a perfumed atmosphere around the flowers.

You see now, why it is, that when you walk in a flower garden in the morning, or towards evening, the flowers seem more fragrant, than in the middle of the day. Humidity in the air

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* It is proper here to observe two important facts connected with the descriptions of plants, which are made by references to natural and artificial forms.

"1st. A certain number of forms were assumed by Linnæus as standards for references; none of which are to be considered as perfect But when nay one of these forms is referred to, it is to be understood that it is nearer the true form of the organ under consideration, than any other of these standard forms.

2d. All standard forms are either drawn from well known natural bodies, or from artificial bodies, or implements known to the ancients. Some of the most common *natural* bodies are the egg, lips of animals, the throat, head, knee, the heart, the kidneys, the hand, bird's feet, spur, feather, tooth, hair, bristles, silk, down, eye lashes, veins, nerves, wings, ears, claws, &c. Some of the most common *artificial* bodies or implements are a spike, spindle, circle, oval, lance, line, awl, arrow, halbert, viol, lyre, saw, shield, cross, sabre, needle, bell, keel, club, cone, leather, cup, fork, urn, wheel, &c." —*Eaton.*

Papilionaceous—anomalous corollas—origin of the odour of flowers—odour affected by temperature—

tends also to render flowers more odorous; it penetrates the delicate tissue of the corollas, and expels the volatile oils. There are some exceptions to the laws just stated; for some flowers are only odorous during the night, and some others during the day. Some flowers exhale fetid odours, which attract such insects, as are usually nourished by putrid animal substances. Many flowers exhale sweet odours; but however odours may differ, in the sensations which they produce, it is certain, they all have a stupifying, narcotic effect upon the nerves, and that it is dangerous to respire, even the most agreeable of them, in a concentrated state, for any great length of time.

One important office of the corolla, is to secure those delicate and important organs which it encloses, the stamens and pistils, from all external injury, and to favor their developement. After the germ has become fertilized by the influence of the pollen, the corolla fades away and either falls off, or remains withered upon the stalk; the juices which nourished it, then go to the germ, to assist in its growth, and enable it to become a perfect fruit.

Another use of the corolla seems to be, to furnish a resting place for insects in search of honey.

The corolla is supposed by Darwin to answer the same purpose to the stamens and pistils, as lungs in the animal system; each petal is furnished with an artery which conveys the vegetable blood to its extremities, exposing it to the light and air under a delicate moist membrane; this vegetable blood according to his theory is then collected and returned in correspondent veins, for the sustenance of the anthers and stigmas, and for the purpose of secreting honey.

Bernardin de Saint Pierre,* author of the interesting story of Paul and Virginia, thinks the corolla is intended to collect the the rays of the sun, and to reflect them upon the stamens and pistils which are placed in the centre.

After all our enquiries into the uses of the corolla, we are obliged to acknowledge, that it seems not as important, in the economy of vegetation, as many less showy organs.

It seems in reality designed chiefly to beautify, and enliven creation by its colour, and fragrance. Although we find much to gratify our curiosity, in inquiring into the wonders of nature,

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* This ingenious author remarks, that man seems the only animal sensible to the sweet impressions, made by the colour and odour of plants, upon the senses; but we think he has asserted too much. Do not the brute creation seem to enjoy, by the sense of smelling, the freshness of the verdant fields? But man is very apt to say, "see all things for my use."

Odours sometimes disagreeable—dangerous of respiration for a long time—uses of the corolla.

and are permitted in some cases, as it might seem, to search into the mysteries of Providence; yet we are ever restricted by the limited nature of our faculties, as if the Creator had said, "Hitherto shalt thou go, but no farther."

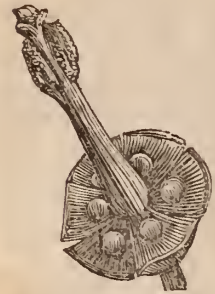
Nectary.

In many flowers there is an organ called a *nectary*, which secretes a peculiar fluid, the honey of the plant; this fluid constitutes the principal food of bees, and various other species of insects.

Linnæus thought the nectary to be separate from the corolla; and every part of the flower which was not stamen, pistil, calyx, or corolla, he called by this name: his remarks on this subject have given rise to more severe criticisms than almost any other part of his system. It is thought he applied the term nectary too extensively, and in too vague a manner. We cannot assert that the nectary is a separate organ from the corolla, because it often makes a part of it; although sometimes it is entirely separate.

The nectary seems not to be confined to any particular part of the flower. Sometimes it is a mere *cavity*, as in the lily.

Fig. 27.



The crown imperial, (*Fritillaria Imperialis*) exhibits in the claw of each of its petals, a nectary of this kind; each one being filled with a sweet liquid, the secretion of the flower. If these drops are removed, others immediately take their place. You have here a representation (Fig. 27) of the crown imperial; its petals appear cut off near the base, in order to show the six nectariferous glands at the base of each.

In the ranunculus, the nectary is a production of the corolla in the form of a *scale;* in the violet a process of the same, in the form of a *horn* or *spur*. In the columbine, the nectary is a separate organ from the petals in the form of a *horn*. In the monks-hood, one of the petals being concave, conceals the nectaries; they are therefore said to be *hooded*.

In monopetalous corollas, the tube is supposed to answer the purpose of a nectary in secreting the honey. In the honeysuckle we find at the bottom of the tube, a quantity of nectari-

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Nectary, its use—not always a separate organ—nectary of the crown imperial—different forms of nectaries.

ferous liquid, yet there is no appearance of any gland or organ, by which it could have been secreted, unless we suppose the tube to have performed this office.

With respect to the purpose for which honey is collected by the nectary and other parts of the flower, there seems among authors to be some difference of opinion. Darwin supposes this to be the food with which the stamens and pistils are nourished, or the unripe seeds perfected. Smith asserts, that the only use of honey with respect to the plant, is to tempt insects, which in procuring it, scatter the dust of the anthers, and fertilize the flower, and even carry the pollen from the barren to the fertile blossoms; this is particularly the case in the fig-tree. Although in the case of plants whose stamens and pistils are on separate flowers, we see this advantage arising from the fact of insects being attracted by the honey, yet since the greater number of plants do not need this assistance in carrying their pollen to the stigmas, we cannot agree with Smith that the only use of honey is to tempt insects. With respect to the use which this substance may serve in the economy of the plant, it seems difficult to determine; some imagine that it especially contributes to the perfection of the stamens; but plants without appearing to secrete honey, have perfect stamens. One thing however is certain with respect to this fluid that without detriment to the plant, it yields to the industrious bee the material for the manufacture of honey, a luxury highly valued from the most ancient times. Virgil knew that bees made honey from the juices which they gathered from flowers; and we indeed, on this subject know but little more than he has beautifully expressed in his pastorals.

LECTURE XIII.

Stamens and Pistils.

Although the calyx and the corolla may be wanting, the stamens and pistils are indispensable to the perfection of the fruit. They are in most plants enclosed by the same envelope, or stand upon the same receptacle; in the class Monœcia they are on different flowers, but from one common root; and in Diœcia, they are on different flowers, springing from different roots. Yet however distant they may be, nature has provided many ways by which the pollen from the staminate flowers may be convey-

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Opinions of different writers respecting their use—Honey.
Stamens and Pistils necessary—

ed to the pistillate, and there assist in pefecting the seed. In order that you may the better understand this curious process, and the organs by means of which it is carried on, we will examine each one separately.

STAMENS.

Stamens are thread-like parts which are exterior with respect to the pistil, interior with regard to the corolla. They exhibit a variety of positions with respect to the pistil. These positions seldom vary in the same family, and they have therefore been taken by the celebrated Jussieu as one of the fundamental distinctions in his classification, called the natural Method. If the stamens are inserted *upon* the pistil, as in umbelliferous plants, they are said to be *epigynous* (from *epi* upon, and *gynia* pistil;) if the stamens are inserted *under* the germ, as in cruciform plants, they are said to be *hypogynous* (from *hypo* under, and *gynia* pistil;) when the stamens are inserted upon the calyx, and thus stand *around* the germ, as in rosaceous plants, they are said to be *perigynous*, (from *peri* around, and *gynia* pistil.)

When a corolla is monopetalous, the number of stamens is usually either equal or double, or half that of the divisions. Stamens in such flowers never exceed twenty.

In polypetalous corollas, the number of stamens may be much greater. When the number of stamens equals the divisions of the corolla, they usually alternate with these divisions. When the number of stamens is double the divisions of the corolla, half of the stamens are usually placed in the intervals of the divisions, and the remaining half before each lobe of the corolla, corresponding to the intervals in the divisions of the calyx. If any of the stamens are barren or without anthers, they are those which are placed before the lobes of the corolla.

In commencing the analysis of flowers according to the Linnæan system, you learned that the *number* of stamens, their position, *relative length*, and connection taken either singly or in combination, afford certain and distinctive marks for purposes of classification. In the first place we find the stamens differing in number, in different plants; some plants have but one, some two, and so on till we come to ten; when they have more than ten, we find the number in the same plant varies, and therefore we cannot depend on the circumstance of number for further classification.

We then resort to position and consider whether the stamens

Definitions of the stamen—Positions with respect to the pistil—Divisions of Monopetalous corollas usually in proportion to the number of stamens—Situation of the stamens with respect to the divisions of the corolla—Stamens used for purposes of classification—Differ in number—In the mode of insertion—

are inserted upon the calyx or not, thus distinguishing an eleventh and a twelfth class. Inequality in the length of stamens, considered with respect to number, furnishes us with a thirteenth and fourteenth class. The connection or union of stamens gives us the fifteenth class, where the filaments of the stamens are united in one set; the sixteenth class where they are in two sets; the seventeeth where the anthers of the stamens are united. The three remaining classes of phenogamous plants are distinguished by the position of the stamens with respect to the pistils. In the eighteenth class the stamens stand on the pistil; in the nineteenth the stamens and pistils are on separate flowers on the same plant; and in the twentieth they are on separate plants.

We will now proceed to the parts of the stamen. The stamen is divided into two parts the *filament* and *anther*.

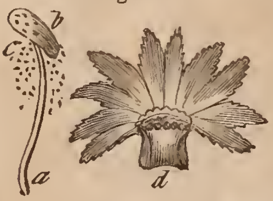
The *Filament*, is so called from *filum*, a thread. Filaments vary in their form; some are long and slender, as in the pink, others are short and thick as in the tulip. They are usually smooth, but in the mullen they are bearded, in the spider-wort, (*Tradescantia*) they are covered with down. In most cases a filament supports but one anther, but sometimes it is forked and bears two or more; in some instances many filaments have but one anther. When the filaments are enclosed in the tube of the corolla they are said to be *inserted*, when they extend out of it *exserted*. In some cases the filament is wanting, and the anther is sessile, or immediately attached to the corolla.

In double flowers the stamens which seem to be intimately connected with the parts of the corolla are changed to petals. This is the effect of cultivation, which by affording the stamens excess of nourishment, causes them to swell out, and thus assume the form of petals. In some double flowers almost every trace of the stamens disappears; in others, it is very easy to perceive the metamorphosis, which they have undergone, as they retain something of their original form. The anthers usually disappear, which shows that the filaments have absorbed all the nourishment. In many double flowers, roses especially, we can see the change as it takes place, some stamens entirely changed, others retaining something of their form, and others still perfect. When all the stamens disappear, no perfect fruit is produced. On account of this degeneration of the stamens, cultivated flowers are not usually so good for botanical analysis, as wild ones. The single flower exhibits the number of parts which nature has given to it. The rose in its native state has but five petals.

In length—In connexion—In position with respect to the pistil—Parts of the stamens—Filament—Stamens changed to petals—

Anther, is a little knob or box usually situated on the summit of the filament, it has cells or cavities which contain a powder called the pollen; this is yellow and very conspicuous in the lily and tulip. You have here the representation (*Fig.* 28) of a stamen with its filament (*a*;) its anther (*b*) and the discharging pollen (*c.*) In many flowers you will perceive the filament to be wanting; the anthers are then said to be sessile; that is, placed immediately upon the corolla; as at (*d.*) which represents a flower cut open, and its five stamens growing sessile in the throat.

Fig. 29.

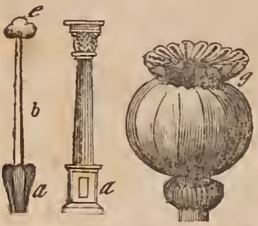


PISTIL.

In the centre of the flower stands the pistil, an organ essential to the plant. Like the stamens the pistils vary in number in different plants, some having but one and others hundreds. Linnæus has founded the orders of his first twelve classes on the number of these organs. When they are more than ten, he does not rely upon their number, which in this case is found to vary in individuals of the same genus.

The pistil consists of three parts, the *germ*, *style* and *stigma*. It may be compared to a pillar; the germ (*Fig.* 29 *a.*) corresponding to the base; the style (*b*) to the shaft; and the stigma (*e*) to the capital.

Fig. 28.



The figure at (*g*) represents the pistil of the poppy; the germ or base is very large and you will perceive that the style is wanting, and the stigma is *sessile* or placed immediately on the germ. The style is not an essential part, but the stigma and germ are never wanting; so that these two parts, as in the poppy, often constitute a pistil.

Germ. The germ contains the rudiments of the fruit yet in an embryo or unformed state. A distinction is to be made between the germ here spoken of, and the germ of the bud. This germ is the future fruit and in passing to the state of the mature fruit, it undergoes a very great change. You would scarcely believe that the pumpkin is but the germ of the small yellow flower of the plant. The germ is said to be *superior* when placed above

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Anther—Pistil, situation and number—Orders founded upon the Pistil—Parts of the pistil—Pistil compared to a pillar—Germ—

the calyx or corolla: as in the strawberry, *inferior* when below them: as in the apple. The figure of the germ is roundish in some plants, cordate and angled in others; indeed, its forms are various, but these you will learn better by observation than description.

Style. This like the filament, is sometimes wanting; when present, it proceeds from the germ, and bears on its summit the stigma. It is usually long and slender, of a cylindrical form, not generally hollow, but formed by a union of bundles of fibres, which transmit from the stigma to the germ the fertilizing pollen.

Stigma. This word signifies a perfecting. The stigma is the top of the pistil, and always present; if the style be wanting, it is placed upon the germ, and said to be *sessile*, as in the tulip. The stigma is various in size and form; sometimes it is a round head; sometimes hollow and gaping, more especially when the flower is in its highest perfection, generally downy, and always more or less moist with a peculiar viscid fluid.

USE OF THE STAMENS AND PISTILS.

It has been observed that the stamens and pistils were necessary to the perfection of the fruit; we will now explain to you the manner in which they conduce to this important object; as you are now acquainted with the different organs and their names, you will no doubt easily understand the explanation.

The pollen, which in most flowers is a kind of yellow dust, is thrown out by the bursting of the anther, which takes place in a certain stage of the flower. The pollen is very curiously formed; although appearing like little particles of dust, upon examining it with a microscope, it is found to be composed of innumerable organized *corpuscles.* These little bodies, though usually yellow, are sometimes white, red, blue, &c. In order to observe them well, it is necessary to put them upon water; the moisture, by swelling them, renders their true form perceptible. They are *oblong* in the Umbelliferous plants, *globular* in the Syngenesious, and *triangular* in some others. In some their surface is smooth, in others armed with little points. They are connected together by minute threads; as in the honeysuckle, &c. These little bodies, thus placed upon water, swell with the moisture until they burst; a liquid matter is then thrown out, and, expanding upon the surface of the water, appears like a light cloud.

"I should never finish," (says the French botanist,* from

* Mirbel.

Style—Stigma—Use of the stamens and pistils—Description of the pollen.

whom this account of the pollen is translated,) "if I should attempt to describe the varieties of appearances in the pollen."

We have translated Mirbel's minute investigation of the nature of the pollen for two purposes: one of which was to show you that wonders exist in nature which common observation cannot detect. You would scarcely have imagined that the yellow dust seen upon the lily or tulip, and scarcely visible upon many other flowers, should exhibit appearances so interesting, as to engage the attention of a learned philosopher to such an extent,and in such a number of experiments, that he should find it too long a task to enumerate all the phenomena which he had observed. It is to convince you that the field of observation in the works of nature is absolutely unlimited, that we have brought this subject before you; for in general our limits at present, do not permit us to penetrate into the minute investigations which delight those who have passed beyond the first principles of natural science.

Another purpose, and one more connected with our present object in what we have explained to you respecting the pollen, is to show its use in the vegetable economy. You have seen the effect of moisture upon the pollen; you will recollect that the stigma was said to be imbued with a liquid substance, and that the anther, when ripe, opens its lids or valves, and throws out the pollen; this, as the pistil is usually situated with regard to the stamens, falls upon the stigma; swelled with the moisture which it there finds, each little sack of the pollen explodes, and the oily substance which it contains is absorbed by the stigma, and passes through minute pores into the germ.

In the germ are seeds formed, but these seeds require the agency of the pollen to bring them to the perfection necessary for producing their species. You see now why the stamens and pistils are so essential to the perfection of a plant. Nature does not form a beautiful flower, and then leave it to perish without any provision for a future plant; but in every vegetable provides for the renewal of the same.

The real use of stamens and pistils was long a subject of dispute among philosophers, till Linnæus explained it beyond a possibility of doubt. They have from the most remote antiquity been considered of great importance in perfecting the fruit. The Date Palm which was cultivated by the ancients, bears stamens and pistils on separate trees. The Greeks discovered that in order to have good fruit, it was necessary to plant the two kinds of trees near together, and that without this assistance the dates had no kernel and were not good for food.

Its use in the vegetable economy—Real use of the stamens and pistils unknown till the time of Linnæus—

In the east at the present day, those who cultivate palms, select the trees with pistillate flowers, as these alone bear fruit. When the plant is in blossom, the peasants gather branches of the wild palm trees, whose blossoms contain stamens, and strew the pollen over their cultivated trees.

Pistillate flowers are called *fertile*, staminate *infertile* flowers.

As moisture causes the pollen to explode, rains and heavy dews are sometimes injurious to plants; the farmer fears wet weather while his corn is in blossom. Nature has kindly ordered that most flowers should either fold their petals together, or hang down their heads when the sun does not shine; thus protecting the pollen from injury.

The fertilization of the fig is said to be accomplished by insects. In this singular plant the fruit encloses the flower, it is at first like a hollow receptacle, lined with many flowers, seldom both stamens and pistils in the same fig. This receptacle has only a small opening at the summit. The seeds therefore in general would not be perfected were it not for certain little flies, fluttering from one fig to the other, and thus carrying the pollen from the staminate to the pistillate flowers.

Although the fertilization of plants where the stamens and pistils are on separate flowers, depends a little upon chance, the favorable chances are so numerous that it is hardly possible in the order of nature that a pistillate plant should remain unfertilized. The pollen is light, its grains are abundant, and the butterflies, the honey bees, and other insects transport them from flower to flower.

The winds also assist in executing the designs of nature.

The pollen of the Pines and Firs rising like a cloud above the forests moved by the wind, disseminates its grains around, some of which falling upon the aments or pistillate flowers, roll within their scaly envelopes and fertilize the germs.

A curious fact is stated by an Italian writer; viz. that in two places, about forty miles distant grew two palm trees the one without stamens, the other without pistils; neither of them of course bore seed for many years; but in process of time they grew so tall as to tower above all the objects near them. The wind thus meeting with no obstruction, wafted the pollen to the pistillate flowers, which to the astonishment of all, began to produce fruit.

The number of plants in which the pistils and stamens are on different flowers, is few compared to those which have these

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Cultivation of palms in the east—Flowers fold their petals in wet weather—Fertilization of the fig—Various methods by which nature conveys pollen to the pistillate plants—Fact stated by an Italian writer—

important organs enclosed within the same corolla; this is the case with most of our plants and shrubs, and even with the trees of hot countries; whose leaves being always present, might impede the passage of the pollen. On the contrary the trees of cold climates have generally the stamens and pistils on separate flowers, blossoming before the leaves come forth, and in a windy season of the year. Those which blossom later, as the oak, are either peculiarly frequented by insects, or like the numerous kinds of firs, have leaves so little in the way, and pollen so excessively abundant, that it can scarcely fail of gaining access to the pistillate flower.

In all cases the pollen and stigma are in perfection at the same time, and the stamens are generally shortest in drooping flowers, and longest in erect ones; thus in both cases hanging over the stigma. "Gardeners formerly attempted to assist nature by stripping off the infertile flowers of melons and cucumbers, considering them as unnecessary incumbrances since they would never become fruit. But finding that they then obtained no fruit at all, they soon learned the wiser practice of admitting the winds to blow, and the insects to transfer the pollen of the infertile to the fruit-bearing flowers."*

LECTURE XIV.

Inflorescence—Receptacle—Fruit—Mirbel's classification of fruits—Linnæus's classification of fruits.

INFLORESCENCE.

Having given our particular attention to the important uses of the stamens and pistils, we shall now proceed to consider the various ways in which flowers grow upon their stalks which is called their inflorescence, or mode of flowering.

The *position* of the flower may be considered under three heads.

With respect to the organs which it contains.

With respect to the branches which support it.

With respect to the flowers which are near it, or which grow on the same peduncle.

* Smith.

Trees of hot countries have mostly stamens and pistils on the same corolla—Trees of cold countries have the stamens and pistils on separate flowers—Pollen and Stigma in perfection at the same time.

Inflorescence—Position of the corolla considered under three heads—

1st. *The corolla with respect to the organs which it contains.*

The corolla when it is monopetalous supports the stamens, the number of which in this case always corresponds to the number of divisions of the limb of the corolla. When the corolla is polypetalous, the stamens are inserted upon the calyx or upon the receptacle; their number is then usually double the number of petals; as in the pink, which has ten stamens and five petals. When inserted *beneath* the germ or base of the pistil, the corolla is said to be *hypo-gynous*, (underneath the style or inferior:) as in the *stramonium*. When it is inserted into the calyx and *surrounds* the germ as in the currant, it is said to *peri-gynous*, (around the style or enveloping it.) When the corolla is inserted *upon* the germ as in the trumpet-honeysuckle, it is said to be *epi-gynous*, (upon the germ, or superior.)

2nd. *The corolla, with respect to the branches which support it.*

The disposition of flowers upon their branches is analogous to that of the leaves; thus the flowers are either *radical*, coming from the root, or *cauline* coming from the stem; they are *peduncled* or *sessile*, *solitary*, *scattered* or *opposite*, *alternate* or *axillary* . They grow in *whorls*, *fascicles*, or *heads*. Sometimes they are *unilateral*, growing on one side of the branch, and sometimes fixed equally upon all parts of the peduncle and pointing in different directions.

3d. *The corolla with respect to the flowers which surround it, or which grow on the same peduncle.*

The different modes of division of the common peduncle into lesser peduncles or supports, cause a great difference in the appearance and situation of flowers, and appear under a variety of forms. The green part which comes from the stem and supports the flower, is called the *peduncle*; sometimes it is called the foot stalk of the flower of fruit. The divisions of the peduncle are called pedicels.

When the plant is one flowered, the flower is usually inserted at the end of the stem, the peduncle in that case is scarcely distinct from the stem.

The most common kinds of inflorescence are as follows;

1st. *Whorl,verticillus*, an assemblage of flowers surrounding the stem or its branches, constitutes a whorl or ring; this is seen in the mint and many of the labiate plants. Flowers which grow in this manner are said to be *verticillate* from

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1st. Corolla with respect to the organs which it contains—2d. Branches which support the corolla—3d. Flowers which surround the corolla—Different kinds of inflorescence—Whorl—

the latin word *verto* to turn round. Leaves surrounding the stem in a similar manner are said to be stellate, or like a star.

2nd. *Raceme*, or cluster consists of numerous flowers on its own stalk or pedicel, and all arranged on one common peduncle, as a bunch of currants.

3d. *Panicle* bears the flowers in a kind of loose subdivided bunch or cluster, without any regular order; as in the oat. A panicle contracted into a compact, somewhat ovate form, as in the lilac, is called a *Thyrse* or bunch; a bunch of grapes is a good example.

4th. *Spike;* this is an assemblage of flowers arising from the sides of a common stem; the flowers are sessile or with very short peduncles; as the wheat and the mullein. A spike is generally erect. The lowest flowers usually blossom and fade before the upper ones expand. When the flowers in a spike are crowded very close, an *ear* is formed, as in *Indian corn.*

5th. *Umbel*, several flower stalks of nearly equal length spreading out from a common centre, like the rays of an umbrella, bearing flowers on their summits; as fennel, and carrot.

6th. *Cyme*, resembles an umbel in having its common stalks all spring from one centre, but differs in having those stalks irregularly subdivided; as the snow ball and elder.

7th. *Corymb*, or false umbel, when the peduncles rise from different heights above the main stem, but the lower ones being longer, they form nearly a level or a convex top; as the yarrow.

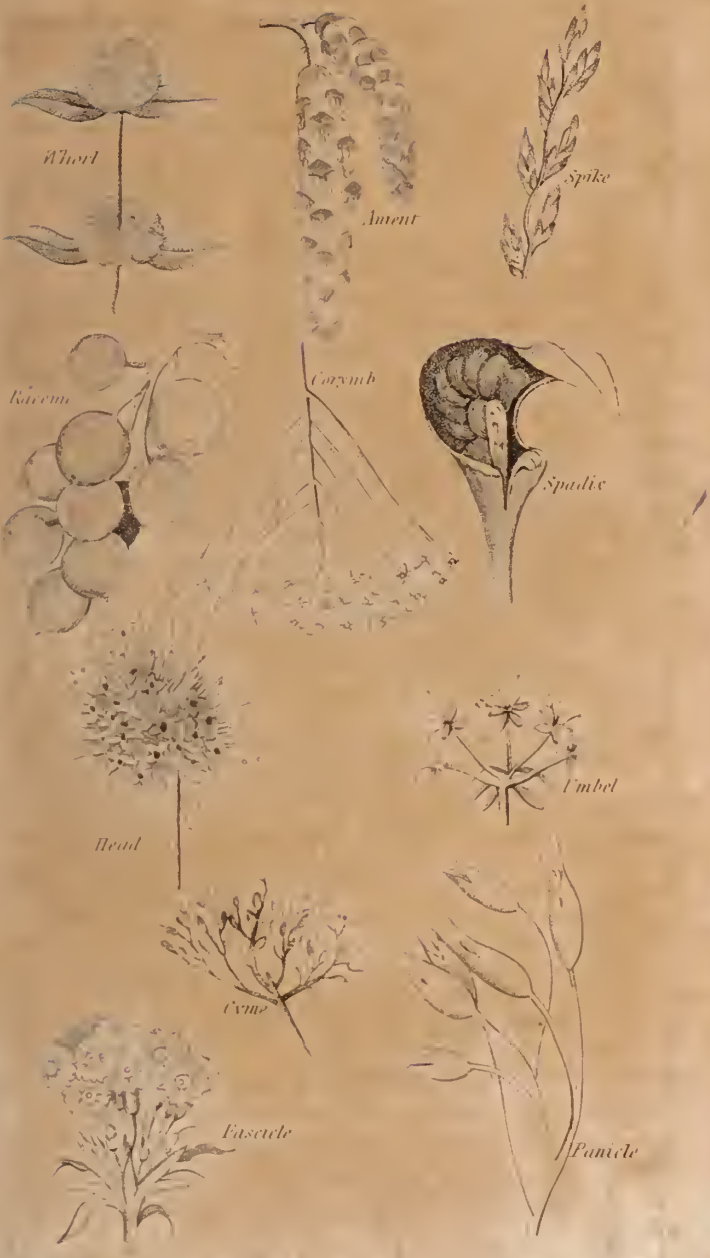
8th. *Fascicle*, flowers on little stalks variously inserted and subdivided, collected into a close bundle, level at the top: as the sweet william; it resembles a corymb, but the flowers are more densely clustered.

9th. *Head*, or tuft, has sessile flowers heaped together in a globular form, as in the clover, and the Button-bush, (*Cephalanthus.*)

10th. *Ament* or catkin, is an assemblage of flowers composed of scales and stamens arranged along a common threadlike receptacle, as in the chesnut and willow; this is more particularly described under the divisions of the calyx. The scales of the ament are properly the calyxes; the whole aggregate, including scales, stamens or pistils, and filiform *receptacle* constitutes the ament.

Raceme—Panicle—Spike—Umbel—Cyme—Corymb—Fascicle—Head—Ament—

INFLORESCENCE PLATE VI.



Illman & Pilbrow.

11th. *Spadix*, is an assemblage of flowers growing upon a common receptacle, and surrounded by a spatha or sheath, as in the Egyptian lily.*

RECEPTACLE.

The receptacle is the extremity of the peduncle; at first it supports the flower, and afterwards the fruit. As this is its only use, it may properly be considered in connexion with the organs of fructification. In simple flowers as the tulip, the receptacle is scarcely to be distinguished from the peduncle, but in compound flowers it is expanded and furnishes a support for the flowers and fruit. Receptacles are of various kinds; as,

1st. *Proper*, supports but one flower, as in the violet and lily.

2nd. *Common*, supports many flowers or florets, the assemblage of which forms an aggregate or compound flower, as in the sunflower and dandelion. The common receptacle presents a great variety of forms; it is either *dry* or *pulpy*: it is *concave* in the artichoke: *convex*, in other plants; *flat* in the sunflower, *conical* in some, and *spherical* in others. As to its surface, it is *punctate*, or interspersed with hollow points or dots, as in the daisy, *hairy* as in the thistle, *naked* as in the dandelion, or *chaffy* as in the chamomile.

3d. *Rachis* is the filiform receptacle which connects the florets in a spike, as in the heads of wheat.

4th. *Columella*, the central column in fruit, to which the seeds are attached, this may be seen in an orange or an apple. The filament which supports the flowers in a rudiment is a receptacle.

5th. The *Spadix*, is a club-shaped receptacle proceeding from a spathe, as in indian turnip.

THE FRUIT.

The fruit is composed of two principal parts, the *pericarp* and *seed*. The term pericarp is derived from *peri* around, and *karpos* seed or fruit; it signifies surrounding the seed. All that in any fruit which is not the seed belongs to the pericarp.

Let us now inquire into the progress of the fruit from its first appearance in the germ of the pistil to its maturer state. When you analyze a flower you often find it necessary to ascertain the number of cells contained in the germ. In making this exam-

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* The student should consult plate VII. which exhibits the different forms of inflorescence, and compare each with the written description.

Spadix—Receptacle—Different receptacles—Fruit, two principal parts—Derivation and signification of the word pericarp—

ination what appearance has the interior of the germ presented when exposed, by cutting it horizontally? You have there seen minute bodies of a pale green colour, and an apparently homogeneous nature; these are called *ovales* and their outer covering is termed an ovary. These ovales before the fertilization of the germ by the pollen, are scarcely perceptible; after this period, and the fading of the corolla, the ovales increase in size, and the embryo and other parts which constitute the seed become manifest. The ovary enlarges with the growth of the ovales; the use of this covering is not confined to the mere protection of the seeds from injury, but it is furnished with glands which secrete such juices as are necessary for the growth, and development of the ovales. As the ovary becomes more mature it takes the name of pericarp. Pericarps in their growth, become either woody or pulpy; the latter absorb oxygen gas and throw off carbonic acid; saccharine juices are elaborated in their cellular integument. In another stage, the pulpy substance passes through a slight fermentation, the organization is affected, the juices sour, the pulp decomposes and putrefaction ensues. Such is the change which you may see in the orange, apple, cucumber, &c. during their progress in decay.

Pericarp and Seed.

The germ being fertilized, the parts of the flower which are not necessary for the growth of the fruit, usually fade, and either fall off, or wither away. The germ continues to enlarge until it arrives at perfection. Every kind of fruit* you can see has been once but the germ of a flower. The size of fruit is not usually proportioned to that of the vegetable which produced it. The pumpkin and the gourd grow upon slender herbaceous plants, while the large oak produces but an acorn.

Every pericarp is formed of a parenchymous substance; this substance is surrounded externally by a cuticle called the *epicarp*, internally by a membrane called the *endocarp*, and an intermediate part called the *mesocarp*. In a peach, for example, the kernel is the seed, the fleshy substance the pericarp; the skin is the *epicarp;* the pulpy cellular substance which absorbs a great quantity of sap and constitutes the principal part of the fruit, is the *mesocarp;* the shell deprived of moisture and nour-

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* The term fruit in common language is limited to pulpy fruits which are proper for food; but in a botanical sense, the fruit includes the seeds and pericarps of all vegetables.

Progress of the fruit considered—Ovales—Ovary—Use of the ovary—Its name in a mature state—Pulpy pericarps— Germ—Size of fruit not in proportion to the plant that produces it—Epicarp—Endocarp—Mesocarp—

ishment by the absorption of the *mesocarp* and thus contracted in its fibres and rendered dry and tough, is the *endocarp*.

The pericarp consists of different parts, as,

1st. *Valves or external pieces* which form the sides of the seed vessels. If a pericarp is formed of but one piece it is *univalved;* the chesnut is of this kind. A pericarp with two valves is said to be *bivalved*, as a pea-pod. The pericarp of the violet is *trivalved*, that of the stramonium *quadrivalved.* Most valves separate easily, when the fruit is ripe; this separation is known by the term *dehiscence.*

2d. *Sutures* or *seams* are lines which show the union of valves; at their seams the valves separate in the mature stage of the plant; they are very distinct in the pod which has two.

3d. *Partitions*, or *dissepiments*, are internal membranes which divide the pericarp into different cells; these are *longitudinal* when they extend from the base to the summit of the pericarp; they are *transverse* when they extend from one side to the other.

4th. *Column*, or *Columella*, the axis of the fruit; this is the central point of union of the partitions of the seed vessels; it may be seen distinctly in the core of an apple.

5th. *Cells*, are divisions made by the dissepiments, which contain the seeds; their number is seldom variable in the same genus of plants, and therefore serves as an important generic distinction.

6th. *Receptacle*, is that part of the pericarp to which the seed remains attached until its perfect maturity; this organ by means of connecting fibres conveys to the seed for its nourishment, juices elaborated by the pericarp.

Some plants are destitute of a pericarp, as in the labiate flowers, the compound flowers, and the grasses; in these cases the seeds lie in the bottom of the calyx, which performs the office of a pericarp.

Mirbel's classification of Fruits or Pericarps—Linnæus's divisions of the same.

Mirbel has divided the fruits of all phenogamous plants into two classes; 1st, *gymnocarps*, which include all such as are not masked or covered by any strange organ, or form no union which conceals their true character. 2nd, *angyocarps*, which include all fruits covered by any strange organ, which disguises them from observation.

Valves—Sutures—Partitions, or dissepiments—Column—Cells—Receptacle of the pericarp—Pericarp sometimes wanting—Mirbel's two grand divisions of fruit—

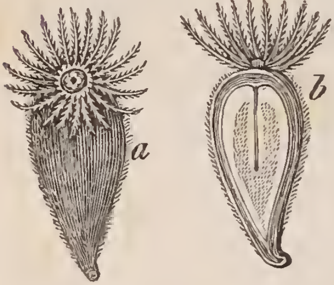
CLASS I. GYMNOCARPS,

Or fruits not concealed.

ORDER 1st. CARCERULARES, (from *carcer* a prison) simple fruits which never open spontaneously.

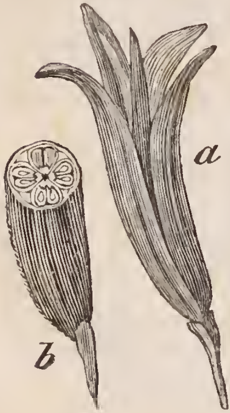
This order consists of several genera, as the fruits of *syngenesious plants*, of the *grasses, &c.* Here is a representation (*Fig.* 30) of a fruit of this order belonging to the germ *Galinsogo*, of the family syngenesia; the pericarp (*a*) is turbinate (shaped like a top;) its surface is pubescent and furrowed; it is *indehiscent* (not opening when ripe) and *monospermous* (having one seed;) the egret is *sessile* and *plumose*. The embryo is *dycotyledonous*, and fleshy. At (*b*) is the same pericarp cut longitudinally, and exposing an inner half of one of the cotyledons.

Fig. 30.



ORDER 2nd. *Capsulares*, simple fruits, having capsules which open when in a mature state.

Fig. 31.



You see here (*Fig.* 31) a capsular fruit, it is the seed of the martagon lily (*Lilium martagon.*) *a* represents the capsule open, as it appears in a mature state; *b* the same, cut tranversely, showing the seeds.

Gymnocarps—-Angiocarps—-Order Carcerulares—-Order Capsulares—Genera in the order capsulares—

Among the genera in this order are;

Legume, which is a bivalved pericarp having its seeds attached to one of its sutures; as the bean and pea. Fig. 32. *a.* represents *a legume*; the fruit of the genus *Astragalus*; *b* represents the same cut transversly in order to show the cells.

Fig. 32.

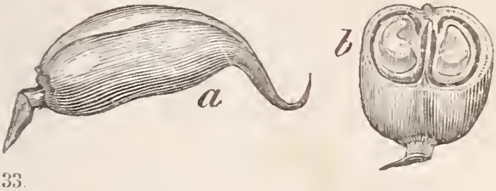
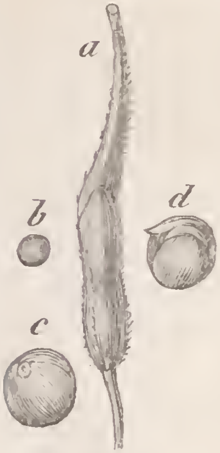
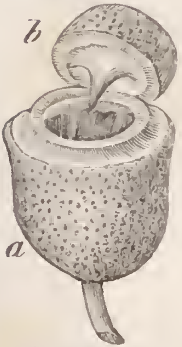


Fig. 33.



Silique, a bivalved pericarp having its seeds attached to each valve; as the pods of cabbage and mustard. *Fig.* 33. *a.* represents a *silique*, the fruit of the Sinapis *alba* (white mustard;) this is said to be *rostrate*, terminating like a bird's beak; *b* represents a globular seed; *c* the same magnified; *d* shows the seed dividing and the embryo making its appearance.

Fig. 34.



Pyxides, (from puxis a box) having its capsule open horizontally, like a box; as the bachelor's button (Gomphrena *globosa.*) This genus may be illustrated by a fruit of the genus *Lecythis*, *Fig.* 34, *a*: *b* represents the lid of the fruit.

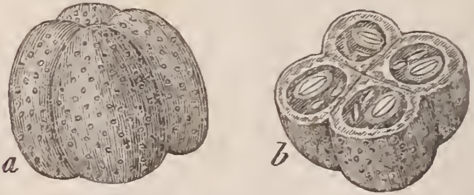
Capsule, a dry pericarp opening by several valves as the lily and tulip.

ORDER 3d. DIERISILIA, (from *diairesis*, division) contains simple fruits which divide into many parts when ripe. The principal genera are *cremorcarp*, (from *kremao* to suspend and *karpos* fruit) having a pericarp, divisible into two seeds, as the coriander, parsley, &c. The other genera in this order are,

Regmate, (from *regma*, opening with noise,) containing many seeds, which are enclosed by two valves, opening by an elastic movement, as euphorbia.

Dieresil, a variable genus, containing such fruits in the order Dierisilia as do not properly come under the two other divisions, as the nasturtion, geranium, &c.

Fig. 35.



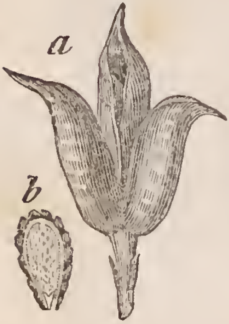
You see here (Fig. 35,) a fruit of the order Dierisilia; it belongs to the genus Regmate. It naturally divides into four seeds; *a* represents the entire fruit, and *b* the same cut transversely.

ORDER 4th. ETAIRIONNAIR, (from *etairoi*, associates,) containing compound fruits: the genera are,

Double Follicle, as in the milk weed (*asclepias*,) having two follicles, each formed of one valve, folded lengthwise.

Etairon, having many seeds ranged round the imaginary axis of the flower, as the ranunculus and anemone.

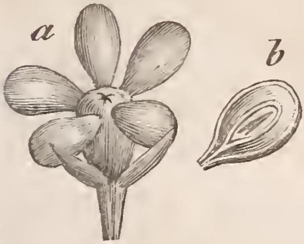
Fig. 36.



Here is the fruit (Fig. 36) of the Aconitum (monks'-hood) which may represent all fruits of this order; it is composed of three pods united in one compound fruit; *a* shows one of the valves in a dehiscent state; *b* represents a seed cut longitudinally.

Order Dierisilia—Gerera in the order Dierisilia—Order Etairionnair—Genera in the order Etairionnair—

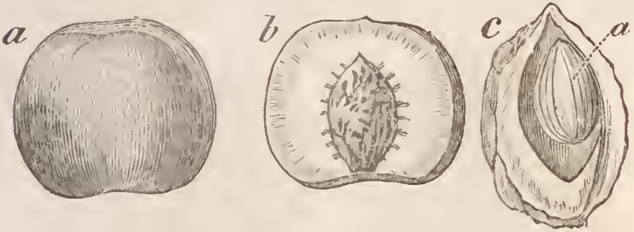
Order 5th. Cenobinnair, (from *koinobion* a community) compound fruits without valves or sutures proceeding from germs without any styles; this order contains but one genus, *Cenobion*, which includes fruit of the labiate plants and some others. This cut (Fig. 37.) represents the pericarp of the genus *Gomphia ;* it is composed of five *companions* (*a*) as Mirbel calls each of the one celled divisions which stand around an ovoid germ, destitute of any style; *b* represents one of these divisions cut vertically; it contains one seed.



Order 6th. Drupaces, simple, succulent fruits, containing a nut. This order has but one genus,

Drupe, which varies in form; the apricot is round and the plum elliptical. The amygdalis *persica*, or peach (Fig. 38.) *a* is a succulent drupe, of a roundish form, and furrowed on the side; the nut is an ellipsoid, long, one celled and one seeded; *b* represents the peach deprived of one half of its pulpy exterior* and exposing the nut; *c* represents the nut divested of one of its valves and showing the seed (*a*).

Fig. 38.



Order 7th. Baccati, (from *bacca* a berry) simple, succulent fruits, containing many separate seeds. The genera in this order are the following:

Pyridion, (from *perideo* to lie around ;) this genus has its fruit crowned with the adhering calyx. The pericarp is fleshy and has many cells, each of which contains one or more seeds; the embryo has two cotyledons. This genus contains the apple and pear. The Apple (Fig. 39)

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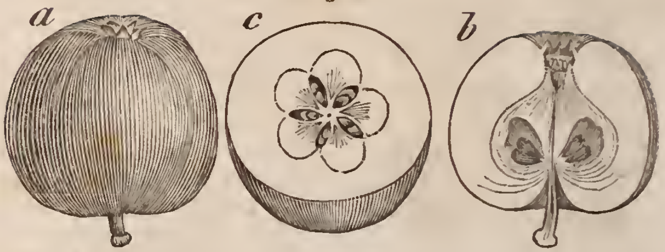
* Panixtern.

Order Cenobinnair—Order Drupaces—Order Baccati—Genera of the order Baccati.

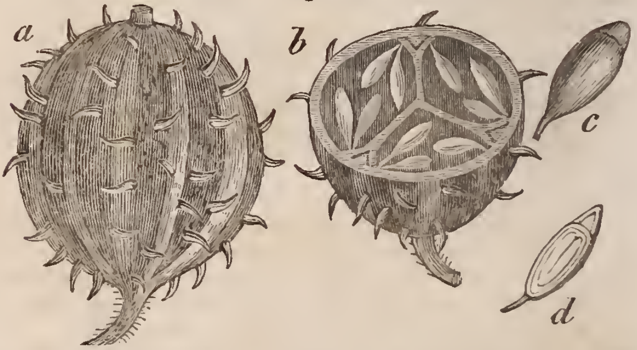
Fig. 39.



(*Malus communis*) has a round, fleshy pericarp, crowned with the calyx; the seeds are enclosed in five cells, ranged around in the centre; the cells are composed of membranaceous valves. The seeds are tunicated or coated; *a* represents an entire Pyridion; *b* the same cut vertically; and *c* the same cut transversely.*

Pepon (from *pepon* a melon) having a pulpy interior, containtaining many seeds; The cucumber, melon, &c. belong to this genus. Here is the fruit (Fig. 40.) cucumis *anguria*, sometimes called prickly cucumber; *a* represents the entire *pepon*, which is *spinous*, three celled and many seeded, as is shown by the same fruit cut transversly as at *b*; *c* represents a seed which is tunicated and dicotyledonous: *d* the same cut vertically.

Fig. 40.



Bacca, containing all the fruits of this order not found in the other genera. The currant, whortlebery, orange, barberry, pericarp of the potatoe, grape &c. are found here. In this cut

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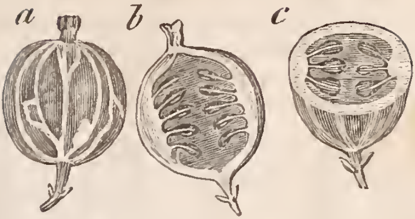
* A singular fact is observable in the fruit of the apple: when cut in slices transversely, it exhibits in its substance an exact representation of the five petals which existed in the flower; I have never met in any botanical work with a notice of this phenomenon, and know not on what physiological principles it can be explained.

Fig. 41.



(Fig. 41.) is a spherical berry, *a*, of the genus Ribes; it is known by the name of the wild gooseberry; the fruit is many seeded as may be seen at *b* which represents it as cut vertically; *c* is the same cut transversely.

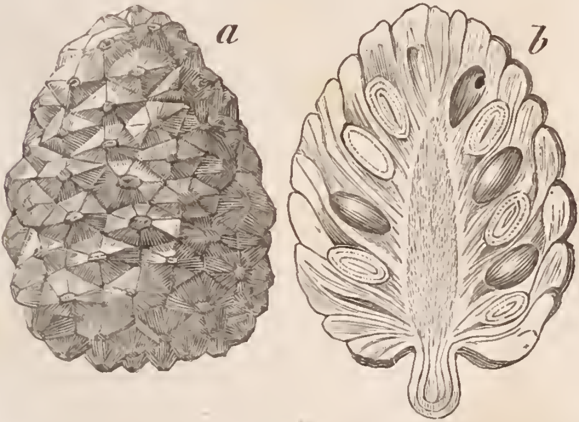
CLASS II. ANGIOCARPES.

Fruits which are covered by some foreign envelope.

This class is divided into five genera; as follows,

1st. *Strobilum or cone*, a collection of fruits concealed by scales

Fig. 42.



whose union forms a globular or conical body, as the juniper, pine, &c. Here is a representation (Fig 42) of the fruit of the Pinus (pine); *a* is an entire *strobilum*; *b* is the same, cut vertically.

2d. *Calybion* (from *Kalubion*, a little cabin); fruits of this genus are composed of glandular pericarps contained in a peculiar kind of bract; in the oak, it is partly concealed; in

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Class Angiocarpes—divided into genera—Strobilum—Calybion.

the beech it is wholly concealed, and also in the yew (*Taxus*); in the latter are two bracts, one enclosing the other; the exterior one is succulent and of an orange red; the interior hard and woody, encloses the fruit.

Here is a representation (Fig. 43) of an acorn, which is the fruit of the oak (QUERCUS *robur*); it stands in a hemispherical cup, formed of imbricated scales. The pericarp, called a gland, is *ellipsoid*, *coriaceous*, one celled, and one seeded. The seed is tunicated; the embryo is dicotyledonous; the cotyledons are large and fleshy. *a*, an entire *Calybion*; *b*, the cup (*d* two abortive glands) *c* the gland cut vertically, showing the embryo near its apex.

Fig. 43.

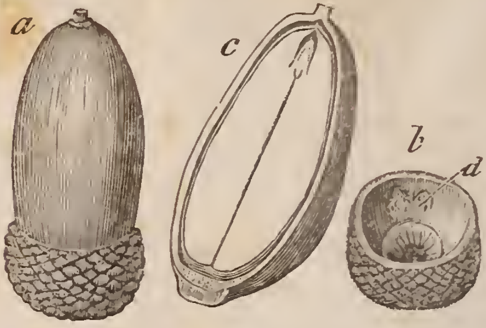
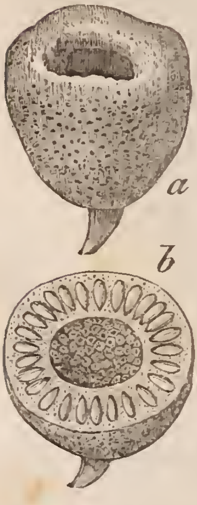
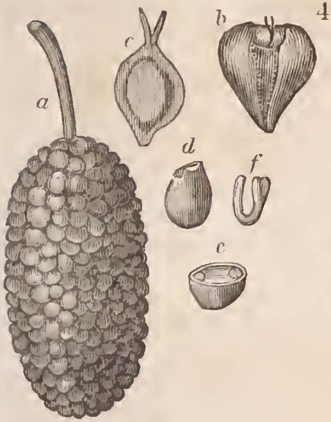


Fig. 44.



3d. *Sycone* (from *sucon* a fig). This genus presents fruits enclosed by a fleshy involucrum or receptacle; as the fig. Fig. 44. *a*, represents a *sycone* or a fig, open at the summit; *b* the same cut transversely.

Fig. 45.



4th. *Sorose* (from *soros* a collection); this genus contains many fruits united in a spike, and covered with floral envelopes in a manner representing a berry, as the mulberry. Figure 45. *a*, represents the fruit of the MORUS *rubra* (red mulberry) which is an example of the genus *soros ;* it is of an oblong from, and each little drupe is surrounded by a succulent pericarp; the nut is one seeded; *b* represents a detached perianth containing a *drupeole* (little drupe); *c* drupeole; *d*, a nut; *e*, the same, cut transversely; *f*, the embryo.

We shall now give a division of fruits which although less strictly scientific than that of Mirbel, may be more easily understood. Linnæus divided pericarps or fruits into the nine following classes; *Capsule, Silique, Legume, Follicle, Drupe, Nut, Pome, Berry and Strobilum.* (See plate VIII.)

1st. CAPSULE, signifies little chest or casket; this is a hollow pericarp, which spontaneously opens by pores, as the poppy, or by scales, as in the mullein. The capsules in opening divide externally into one or more pieces called *valves ;* the internal divisions of the capsule are called *cells ;* these are the chambers appropriated for the reception of the seeds; according to the number of these cells, the capsule is *one celled*, *two celled*, &c. The membranes by which the capsule is divided into cells are called *dissepiments*, or partitions; these partitions are either parallel to the valves or contrary. The *columella* is the central pillar in a capsule; and is the part which connects the several internal partitions with the seed. It takes its rise from the receptacle and has the seed fixed to it all around.

2d. SILIQUE or *Siliqua*, is a two valved pericarp or pod, with the seeds attached alternately to its opposite edge, as mustard and radish. The proper silique is two celled, being furnished with a partition which runs the whole length of this kind of pericarp; there are some exceptions to this, as in the celandine. *Silicle* (*silicula*, a little pod,) is distinguished by being shorter than the proper silique; it is al-

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Sorose—Linnæus's division of pericarps—Capsule—Silique.

most round, as in shepherd's purse. This difference in the form of the Silique and Silicle is the foundation of the distinction of the orders in the class Tetradynamia.

3d. Legume, is a pericarp of two valves, with the seeds attached only to one *suture* or seam; as the pea. In this circumstance it differs from the Silique, which has its seeds affixed to both sutures. The word *pod* is used in common language for both these species of pericarp. Plants which produce the legume are called *Leguminous*. The greater number of these plants are in the 16th class, Diadelphia. The tamarind is a legume filled with pulp, in which the seeds are lodged.

4th. Follicle, is a one valved pericarp which opens longitudinally on one side, having its seed loose within it, that is, not bound to the suture. We have examples of this in the dog's bane, (*Apocynum*,) which is a double follicle, and in the milk weed, (*Asclepias*.)

5th. Drupe, a stone fruit, is a kind of pericarp which has no valve, and contains a nut or stone, within which there is a kernel. The Drupe is mostly a moist succulent fruit: as in the plum, the cherry, and the peach. The nut or stone, in the drupe is a kind of woody cup commonly containing a single kernel, called the *Nucleus;* this hard shell, thus enveloping the kernel, is called the *Putamen;* it may be seen in the stone of a cherry or peach.

6th. Nut is a seed covered with a shell resembling the capsule in some respects, and the drupe in others: as the walnut, chesnut, &c.

7th. Pome is a pulpy pericarp without valves, but containing a membranous capsule, with a number of cells, which contain the seeds. This species of pericarp has no external opening or valve. The apple, pear, quince, the gourd, the cucumber, and the melon, furnish us with examples of this kind of pericarp. With respect to form, the Pome is oblong, ovate, globular, &c. the form of fruits being much varied by climate and soil. You know that apples are not uniform in their size or figure. With respect to the number of cells also, the apple is variable.

8th. Berry is a succulent pulpy pericarp, without valves, and containing naked seeds, or seeds with no other covering than the pulp which surrounds it; the seeds in the berry are sometimes dispersed promiscuously through the pulpy substance, but are more generally placed upon receptacles within the pulp. A compound berry consists of several

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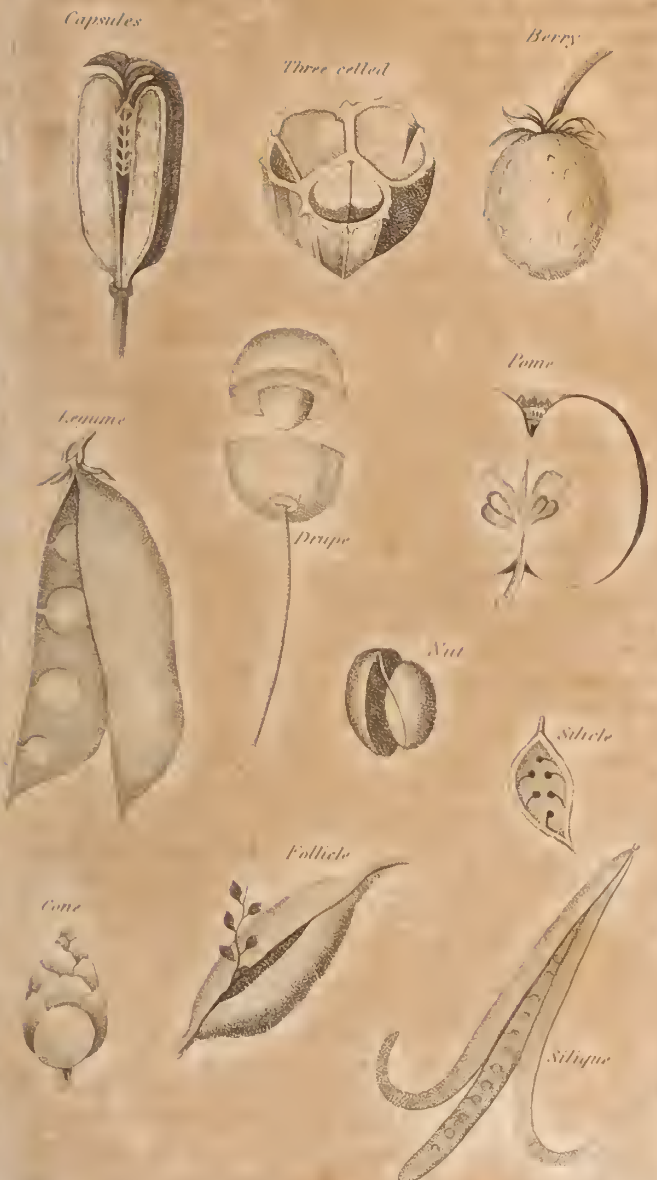
Legume—Follicle—Drupe—Nut—Pome—Berry.

PLATE VII.


Capsules
Three celled
Berry
Drupe
Pome
Legume
Nut
Silicle
Follicle
Cone
Silique

single berries, each containing a seed, united together; as in the raspberry. Each of the separate parts is called an *Acinus*, or grain. The orange and lemon are berries with a thick coat. There are some kinds of berries, usually so called, that seem scarce entitled to the name; for the pulp is not properly a part of the fruit, but originates from some other organ.

In the mulberry and strawberry the calyx becomes coloured and very juicy, surrounded by seeds like a real Berry. Some botanists, in describing the strawberry, say that what is commonly called the berry, is but a pulpy receptacle, studded with naked seeds. In the fig the whole fruit is a juicy calyx, or common receptacle, containing in its cavity innumerable florets, each of which has a proper calyx of its own, which becomes pulpy, and invests the seed, as in the mulberry. The paper mulberry of China, which is analogous to it , is an intermediate genus between the two, being, as it might seem, a fig laid open, but without any pulp in the common receptacle.

9th. Strobilum, a cone, is a Catkin or Ament hardened and enlarged into a seed vessel, as in the pine; this is called an aggregate, or compound pericarp. In the most perfect examples of this kind of fruit the seeds are closely enveloped by the scales as by a capsule. The Strobilum is *oblong* in the pine, *round* in the cypress, very small in the alder and birch.

The time for examining fruits is, of course, after the flowers have passed away. After you have understood the simple division of fruits we have now given, you will not generally be at a loss to which of these classes to refer them, when you see an apple, a walnut, a currant, or a pine apple. You may gratify the mental appetite by examining their appearance with an inquiring mind. It would seem more rational for young persons to examine the number of cells or seeds in an apple, with a view to a classical arrangement, than to count the seeds with the foolish idea that there is some charm in a certain number, which will throw light upon their future destiny.

Strobilum—Best time for examining fruits.

LECTURE XV.

The Seed.

We have now traced the plant from the root through all its various organs, until we have arrived at that part, which is a link in the chain of vegetable existence between the old and new plant; if this were destroyed, if the seeds of plants were no longer perfected, what changes would the whole face of nature present. The earth would in one year be stripped of the whole tribe of *annual* plants; in another the *biennial* plants would vanish, leaving a still more cheerless vacancy; the *perennial* would year after year disappear, until, (if we could suppose our own lives to be prolonged in such a strange state of nature,) we should behold the earth one vast scene of vegetable ruin; occasionally here and there a venerable oak or an ancient pine would stand in solitary grandeur, the mournful remnants of the once beautiful and fertile vegetable kingdom.

But such a sad spectacle the earth will never present, for we have the promise of God himself, that "while the earth remaineth seed time and harvest shall not cease."

We have seen in the progress of our inquiries, that while the present plant is diffusing around it beauty and fragrance, administering to the necessities and luxuries of man, the watchful care of that Being who never slumbers nor sleeps. is by a slow but certain progress perfecting that part, which is destined to continue the species and which is, "the sole end and aim of all the organs of fructification."*

The seed is that internal part of the fruit which envelopes the complete rudiment of a new plant, similar to that from which it received its existence. Seeds are various in their form; the mustard is globular; some species of beans are oblong; the cocoa nut is ovoid; the buck wheat is angular, &c.

The seed consists of three principal parts, viz. the *eye*, *husk and kernel.*

1st. The *eye* or *hilum* is the scar formed by the separation of the membrane or thread which connected the seed with the pericarp, and conveyed to the former the necessary nourishment. This connecting membrance is usually very short; but in the *magnolia* it is some inches in length.

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* Linnæus.

Appearances which nature would present if the seed were no longer perfected—Seed contains the rudiment of a new plant—Forms of seeds—Parts of the seed—Eye.

When the seed is fully ripe, the connexion between it and the pericarp, ceases by the withering and separation of the connecting membrane, leaving upon the outer surface of the seed the mark of its insertion. This eye or scar is very conspicuous in the bean, which also exhibits the pore through which the nourishment was conveyed to the internal parts of the seed. That part of the seed which contains the eye is called the *base ;* the part opposite, is called the *apex.*

2nd. The *Husk*, is the outer coat of the seed which on boiling becomes separate; as in peas, beans, Indian corn, &c. this skin is also called the *spermoderm* from the Greek words, *sperma*, signifying seed and *derma* skin. The *spermoderm* or skin of the seed consists of three coats, analogous to the three divisions of the pericarp; the external *skin*, called the *testa* or *cuticle* corresponds to the *epicarp* or outer covering of the pericarp; the cellular tissue called *mesosperm*, corresponds to the mesocarp, or middle of the pericarp; and the internal skin or *endosperm* corresponds to the *endocarp* or inside skin of the pericarp.*

The husk surrounds the kernel; it is essential, as the kernel which was originally a fluid, could not have been formed without its presence.

3d. The *Kernel*, includes all that is contained within the husk or *spermoderm*; it is also called the *nucleus* or almond of the seed. The kernel is usually composed of the *albumen*, *cotyledon* and *embryo.* The *Albumen*, is that part of the kernel which invests the cotyledons or lobes, and is thought to afford the same support to the germinating embryo, that the white of an egg does to a chicken. Both in respect to hardness and color, the albumen in many seeds, greatly resembles the white of a boiled egg. It is not considered an essential part of the seed, because it is sometimes wanting; but when present it supports and defends the embryo, while imprisoned in the seed, and serves for nutriment when it begins to germinate. It has no connexion with the embryo and is always so distinct as to be easily detached from it. Albumen makes up the chief part of some seeds, as the grasses, corn, &c; in the nutmeg, which has very small cotyledons, it is remarkable for its variegated appearance and aromatic quality. It chiefly abounds in plants which are furnished with but one cotyledon.

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* These three divisions may not always seem distinct, as in some cases, the *mesosperm* is scarcely to be separated from the cuticle.

Husk—Spermoderm, divisions—Cuticle—Mesosperm—Endosperm—Husk essential—Kernel—How divided?—Albumen—

Cotyledons, (from a Greek word *kotule*, a cavity) are the thick fleshy lobes of seeds, which contain the embryo. In beans they grow out of the ground in the form of two large leaves. They are the first visible leaves in all seeds, almost always fleshy and spongy, of a succulent and nourishing substance, which serves for the food of the young plant at the moment of its germinating. Nature seems to have provided the cotyledons to nourish the young plant in its tender infancy. After seeing their young charge sufficiently vigorous to sustain life without their assistance, the cotyledons, in most plants wither and die. The number of cotyledons varies in different plants, and there are some plants which have none.

Acotyledons, are those plants which have no cotyledons in their seeds; such as the *cryptogamous* plants, *mosses*, &c.

Mono-cotyledons, such as have one cotyledon or lobe in the seed; as the *grasses*, the *liliaceous* plants, &c.

Di-cotyledons, seeds with two cotyledons: they include the greatest proportion of vegetables; as the *leguminous*, the *syngenesious*, &c.

Poly-cotyledons. Those plants the seeds of which have more than two lobes: the number of these is small; the *hemlock* and the *pine* are examples.

The number of cotyledons seldom varies in the same family of plants: it has therefore been assumed by some botanists as the basis of classification; but there are difficulties attending a method wholly dependant on these organs. In order to be certain as to their number, it is necessary to examine the seed in a germinating state, which often is difficult. The natural method of Jussieu is founded upon the number of cotyledons.

The *Embryo*, is the most important part of the seed, as it forms the new plant; all other parts of the seed seem but subservient to this. The embryo has been called the *Corculum*, or heart: it is the point from whence the life and organization of the future plant originate. In most dicotyledonous seeds, as the bean, orange and apple, the embryo may be plainly discovered. Its internal structure, before it begins to vegetate, is very simple, consisting of a uniform substance, enclosed in its appropriate bark or skin. When the vital principle is excited to action, vessels are formed and parts developed which seemed not previously to have existed. The embryo is usually central and enclosed by the cotyledons: sometimes it is no more than a

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Cotyledons—Number of cotyledons made the basis of classification—Embryo.

mere point or dot, and in some cases, altogether invisible to the naked eye. The embryo consists of two parts.

The *Plume*, which is the ascending part, unfolding itself into herbage.

The *Radicle*, or descending part which unfolds itself into roots.

To use the words of an ancient botanist; "the embryo continues imprisoned within its seed, and remains in a profound sleep, until awakened by germination, it meets the light and air to grow into a plant, similar to its parent."

> "Lo! on each seed, within its slender rind,
> Life's golden threads in endless circles wind:
> Maze within maze the lucid webs are roll'd,
> And as they burst, the living flame unfold.
> The pulpy acorn, ere it swells, contains
> The oak's vast branches in its milky veins,
> Each ravel'd bud, fine film, and fibre-line,
> Traced with nice pencil on the small design.
> The young Narcissus, in its bulb compress'd,
> Cradles a second nestling on its breast;
> In whose fine arms a younger embryo lies,
> Folds its thin leaves, and shuts its floret-eyes;
> Grain within grain successive harvests dwell,
> And boundless forests slumber in a shell."*

There are various appendages which may, or may not be present without injury to the structure of the seed.

Aigrette or *Egret* sometimes called *pappus*, is a kind of feathery crown with which many of the compound flowers are furnished, evidently for the purpose of disseminating the seed to a considerable distance by means of winds; as the dandelion. It includes all that remains on the top of the seed after the corolla is removed.

Stipe is a thread connecting the egret with the seed. The egret is said to be *sessile* when it has no stipe, *simple* when it consists of a bundle of hairs without branches, *plumose* when

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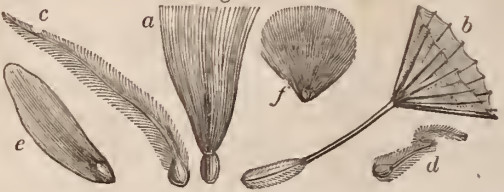
* These lines which so beautifully set forth the manner in which the embryo is contained within the seed or bulb, are not entirely philosophical as to the fact of the future generations lying enfolded the one within the other; it is true, that we may in many seeds, by the help of a microscope, discern the form of the future plant, and even the embryo flower; but we cannot believe that, in the seed of that embryo flower, is the miniature image of another plant, which contains another, and so on through successive generations; for the fact is established that a seed does not produce a plant without being fertilized by the pollen. We may say that a seed contains within itself the *elements* of future generations; but not their *images*, except that of the immediate plant which is to issue from the perfected seed.

Divisions of the embryo—Appendages to seeds—Egret—Stipe—

each hair has other little hairs arranged along its sides, like the beards on a feather. In this figure (46.) *f* represents the *sessile egret*; *a*, the *capillary*, or hair-like egret; *b* the *plumose* or feathery egret; *c* and *d* show the style remaining, and forming a *train* as in the *virgin's bower* and *geam*; *e*, a *wing* as may be seen in the fir.

Fig. 46.



General Remarks upon Seeds.

The number of seeds in different plants is variable; some have but one, some have two, which is the case with the Umbelliferous plants; some have four, as in the rough leaved plants; and in the order Gymnospermia of the class Didynamia, there are four lying naked in each calyx. The number varies from these to thousands. A stalk of indian corn is said to have produced in one season two thousand seeds. A sunflower four thousand. A capsule of the poppy has been found to contain eight thousand seeds. It has been calculated that a single thistle seed will produce at the first crop, twenty four thousand, and at the second crop, at this rate, five hundred and seventy six millions. In the same species of plants the number of seeds is often found to vary. The apple, and many others might be given as examples.

Seeds also vary in size, and have been divided into four kinds; *large*, from the size of a walnut, to that of the cocoa nut; *middle* size, neither larger than a hazle nut, nor smaller than a millet seed; *small*, between the size of the seeds of a poppy and a bell flower; *minute*, like dust or powder, as in the ferns and mosses.

When a pericarp separates itself from the parent plant, or when the valves of the fruit open, this is not the effect of vital activity, but a proof that the fruit has ceased to vegetate. The fruit, like the leaves, at the end of autumn, losing the vital principle, is submitted to the laws which govern inorganized matter.

The period in which the seeds arrive at maturity, marks the

Number of seed variable—Size variable—Separation of the pericarp from the plant—

period of the life of annual plants, and the suspension of vegetation in woody and perennial plants. Nature, in favouring by various means the dispersion of seeds, presents phenomena worthy of our admiration, and these means are as varied as the species of seeds which are spread upon the surface of the earth.

The atmosphere, winds, rivers, seas, and animals of all species, transport the seeds and disperse them in every direction. Seeds provided with feathery crowns, (egrets,) as the dandelion and thistle; with wings, as the maple and ash, are raised into the air and even carried across the seas. Linnæus asserted that the ERIGERON *canadense* was introduced into Europe from America, by seeds wafted across the Atlantic Ocean. "The seeds," says Linnæus, "embark upon the rivers which descend from the highest mountains of Lapland, and arrive at the middle of the plains, and the coasts of the seas. The ocean has thrown even upon the coasts of Norway, the nuts of the mahogany, and the fruit of the cocoa nut tree borne on its waves from the far distant tropical regions: and this wonderful voyage has been performed without injury to the vital energy of the seeds."

Some fruits endowed with great elasticity, throw their seeds to a considerable distance. In the oat, and in the greater number of ferns, this elasticity is in the calyx. In the *Impatiens*, in the cucumber, (*Cucumis*,) and many others, it resides in the capsule. The pericarp of the IMPATIENS, consists of one cell with five divisions; each of which when the seeds are ripe, upon being touched, suddenly folds itself in a spiral form, leaps from the stem, and scatters by means of its elastic property, its seeds to a great distance.

Animals also perform their part in the diffusion of seeds. Squirrels and other animals carry seeds and nuts into holes in the earth. The Indians believe that the squirrels plant all the timber of the country; though this may be an exaggeration, there is no doubt but that they do much towards diffusing different kinds of nuts and seeds; as chesnut, oak, walnut, &c. Animals contribute to the distribution of seeds by conveying them in their wool, fur, or feathers. Although distance, chains of mountains, rivers and even seas, do not present obstacles sufficient to prevent the dispersion of vegetables, *climate* fixes an eternal barrier which plants cannot pass. It is not unlikely that in future times the greater part of vegetable tribes which grow between the same parallels of latitude, may be common to all countries of that zone; this may be the result of the industry of man, aided by the efficient means which nature takes to promote the same object in the dissemination of seeds; but no human power can ever cause to grow within the polar circles,

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Dispersion of seeds.

the vegetables of the tropics, or those of the poles at the equator. Nature is here stronger than man. That something may be done by art to promote the growth of the tropical plants in our climate is true, but how different are the same plants with us, from what they are in their own genial climate; we toil and watch for years to nurture an orange or lemon tree, which after all is stinted in its growth, while in its own native home it would have grown spontaneously in luxuriant beauty.

The diffusion of seeds completes the circle of vegetation and closes the scene of vegetable life. The shrubs and trees have lost their foliage—the withered herbs decompose, and restore to the earth the elements which they have drawn from its bosom. The earth stripped of its beauty, seems sinking into old age; but although unseen by us, and unmarked the processes of nature by too many among men, innumerable germs have been formed, which wait but the favorable warmth to decorate with new brilliancy this terrestrial scene.

So fruitful is nature, that a surface a thousand times more extended than that of our globe, would not be sufficient for the vegetables which the seeds of one single year would produce, if all should be developed; but the destruction of seeds is very great, either eaten by animals, or left to perish in unfavorable situations. Those which are preserved constitute but a small proportion of the whole; they are either carried into the clefts of rocks, or buried beneath the ruins of vegetables; protected from the cold, they remain inactive during the winter season, and germinate as soon as the early warmth of spring is felt. Then the botanist who considers with a curious eye the vegetable species with which the earth begins to be clothed, seeing successively all the types or representations of past generations of plants, admires the power of the Author of nature, and the immutability of His laws.

LECTURE XVI.

Germination of the Seed.

We have now considered the various organs of plants, we have traced them through their successive stages of developement, from the root to the bud, the leaf and flower, from the flower to the fruit and seed. We have seen in imagination the vegetable world fading under the change of temperature; were this appearance of death in the vegetable world presented to us

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Circle of vegetation completed—concluding remarks.

for the first time, how gloomy would be the prospect! How little should we expect its return to life and beauty, and fragrance. No power short of Omnipotence could effect such wonders. But we are now so accustomed to these changes, that "seeing we perceive not." We do not think of the Mighty Worker of these miracles; we call them the operations of nature. And what is nature or what are the laws of nature, but manifestations of the Almighty? We are liable to be led into scepticism by the word nature, which being so vague in its meaning, may signify any thing, and thus we gradually accustom ourselves to affix to it no meaning at all.

How beautifully is this reanimation of the vegetable world brought by St. Paul, as an illustration of our resurrection from the dead. The same power which from a small, dry, and apparently dead seed, can bring forth a fresh and beautiful plant, can also, from the ruins of our mortal bodies, produce a new and glorious body, and unite it to the immortal spirit by ties never to be separated.

Germination. (See plate IX.) The process of the shooting forth of the seed is termed germination. The principle of life contained in the seed does not usually become active until the seed is placed in circumstances favorable to vegetation. When a seed is committed to the bosom of the earth, its various parts soon begin to dilate by absorbing moisture. A chemical action then commences; oxygen from the air unites to the carbon of the seed and carries it off in the form of carbonic acid gas. As the carbon of the cotyledons by the process continues to diminish, and oxygen is produced in excess, a sweet sugar-like substance is formed; this is conveyed to the embryo, which by this new nourishment is kindled into active life; and from this period we may date the commencement of the existence of the young plant. Bursting through the coats which surrounded it, and which are already enfeebled by their loss of carbon, the embryo emerges from its prison, the *radicle* shoots downward, and the *plume* rises upwards. We say then that the seed has come up or sprouted. The radicle, or descending root, is usually the first to break through the coats of the seeds; it commences its journey downwards, to seek in the earth nourishment for the future plant, and to fix it firmly in the earth. This constitutes the root and always takes a downward course in whatever situation the seed may have been placed in the ground. A botanist once planted in a pot, six acorns, with the points of their embryos upwards. At the end of two months, upon removing the earth,

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Reanimation of the vegetable world—Germination—Principle of life in the seed—Effect of chemical action—The embryo bursts its prison—

he found that all the radicles had made an angle to reach downwards. It is supposed that if the root met with no obstruction in going downwards it would always be perfectly straight. If you put cotton wool into a tumbler of water and place upon it some seeds of rye or wheat, which soon vegetate, you will see all the fibres shooting from the seeds in a perpendicular direction downwards. It is a very simple and interesting experiment. Some ascribe this phenomenon to the laws of gravitation, by which the root is attracted towards the centre of the earth; others say that the radicle stimulated by moisture, extends itself in the natural direction from which the moisture proceeds; and some imagine that the plant is endowed with a kind of instinct, similar to that which often appears in animals from their first moments of existence, leading the little duck to seek the water and birds to attempt to fly; but let us call this power by what name we will, or refer it to whatever secondary laws, we must after all, attribute it to the will and design of *Him* who gave the plant a principle of vitality.

After the young root has made some progress, the cotyledons swell, and rising out of the ground form two green leaves, called *seed leaves.* You have no doubt noticed their appearance in the garden bean, when it first appears above the ground. When the plume developes leaves, these seed leaves are no longer needed, and they generally wither and decay.

You will recollect that the embryo or germ is composed of two parts, the radicle and the plume. The radicle we have just seen extends itself downwards. Soon after this part of the germ has begun its downward course, the plume, (so called from its resembling a little feather,) rises upwards, and soon becomes a tuft of young leaves, with which the stem, if there is one, ascends. As particular examples often impress themselves more strongly upon the mind, than general principles, we will quote the following article from Sumner's Botany. "Some rye was planted in a good soil, and at the end of the second day its radicle was discernible. At the end of twenty four hours the embryo had escaped from its integument. On the second day the fibres of the root had augmented, but the leaves had not appeared. On the fourth day the first leaf began to appear above the ground, at which time the colour was red. On the fifth day, it had grown to the length of an inch, and its colour was now green, and on the sixth day the second leaf had appeared."

Rye however belongs to that class of plants whose seeds have but one cotyledon; this never rises above the ground to form a seed leaf. Seeds with but one cotyledon are chiefly composed of albumen, which performs the same office of nourishing the

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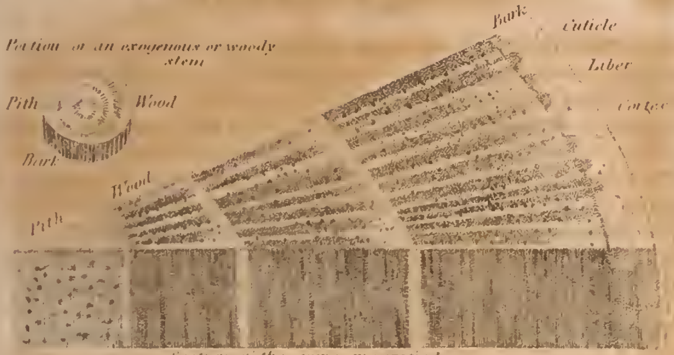
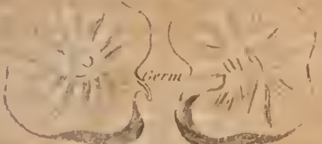
Radicle why carried downwards—Plume—Seedl eaf—Seeds with but one Cotyledon—

Portion of an exogenous or woody stem

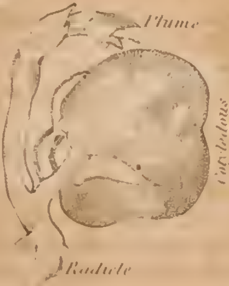


Section of the same magnified

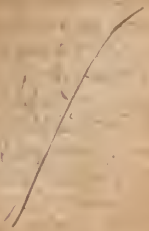
Bean divided



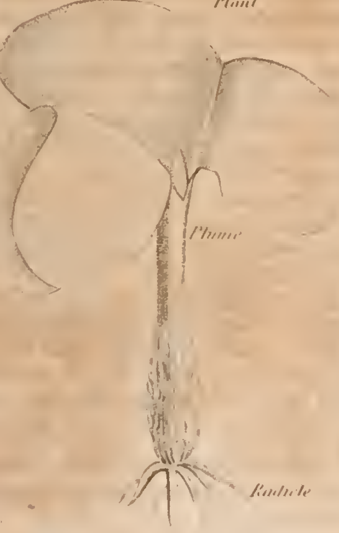
Cotyledons



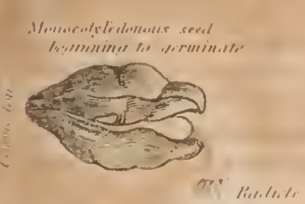
Skeletons of Leaves



Dicotyledonous Plant



Monocotyledonous seed beginning to germinate



embryo during its germination, as do the cotyledons of dicotyledonous plants. In some monocotyledons is perceived under the albumen or white, a part called *Vitellus*, or the yolk; this like the albumen is entirely converted into nourishment for the young plant; it may be seen in the seeds of grasses, and is conspicuous in the Indian corn.

We have observed that *moisture* is essential to the germination of the seed. *Earth*, though not absolutely essential, is useful, as affording to the vegetable egg a favorable situation, where it may receive the influence of the various agents, which are to perform their offices in the developement of its parts. It seems too, not improbable, that some of the constituent elements of earth may be absorbed by the germinating plant, and converted into nourishment. It is however sufficiently apparent that plants may vegetate without earth. The parasite grows upon the bark of other plants; many seeds vegetate in water, and some if moistened and placed on cotton, or other supporting substance. *Air* is essential to vegetation; under an exhausted receiver a seed will not germinate, although possessing every other requisite. Seeds that are planted very deeply in the ground, do not vegetate, unless accidentally ploughed up, or exposed to the contact of the atmosphere. Acorns which are supposed to have lain for centuries, have germinated as soon as they were raised sufficiently near the surface to receive the influence of air. You will recollect that in the process of germination, *oxygen gas* unites with the carbon of the seed, and carries it off in the form of carbonic acid. Air furnishes that important agent, oxygen, which is the first moving principle of vitality. Carbon constitutes the greater part of the substance of seeds; and this principle being in its nature, opposed to putrefaction, prevents seeds from rotting, previous to their being sown. Some seeds having an abundance of carbon, are capable of being preserved for ages; while others, in which this element exists but in a small proportion, require to be sown almost as soon as ripe; and such as are still more deficient in carbon, lose their vital principle, before separating from the pericarp.

You can now understand that oxygen is important to germination, on account of its agency in removing the carbon which held the living principle of the seed in bondage.

The *absence of light* is favorable to the germination of seeds; for light acts upon plants in such a manner as to take away ox-

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Nourishment of the young plant—Various agents promote the germination of the seed—Air essential to vegetation—Oxygen an important agent—Carbon in relation to seeds—The absence of light favorable to the germination of plants.

ygen by the decomposition of carbonic acid gas, and to deposite carbon; now this is just the reverse of the process required in germination, where the carbon must be evolved and the oxygen in excess.

A certain degree of *heat* is necessary to germination. Seeds planted in winter, will remain in a torpid state; but as soon the warmth of spring is felt, the embryo emerges into life. By increasing heat, seeds may be hastened in their vegetating process; thus the same seed, which with a moderate degree of heat would germinate in nine hours, may be brought to this state in six hours, by an increase of temperature. Too great heat destroys the vital principle; thus corn which has been roasted could never be made to vegetate. The process of malting consists in submitting grain of a certain kind, (that of barley is most commonly used,) to a process which causes an incipient stage of germination; this is done by moistening the grain and exposing it to a suitable degree of warmth; as soon as germination commences, the process is stopped by increasing the heat. The taste of the grain is then found to have become sweetish.

The term *malt* is given to grain which has been submitted to this process. When mixed with water it forms a sweet liquor; and the fermentation of this liquor produces beer.

We have now seen the two parts of the embryo commence their destined course. The radicles lengthen downward by additions to their extremities; the plume bythe developement and increase of parts previously existing.

You perhaps are surprised that so much can be said about things which may never have appeared strange or interesting to you before, and yet we do but glance at the different subjects as we proceed. We have said very little about the anatomy and physiology of plants, although they present a wide field for investigation.

Season of Germination.

There is a great difference in plants as to their time of germinating; some seeds begin to vegetate before they are separated from the pericarp.*

* In the month of January, on observing the seeds of a very juicy apple which had been kept in a warm cellar, I saw that they were swollen, and that the outward coat had burst; examining one seed by removing the tegument, and separating the cotyledons, I saw by the help of a microscope

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A certain degree of heat necessary—Effects of too great heat exemplified in the process of malting. Plume why not carried downward like the radicle.

In the greater number of vegetables, however, there is no germination until after the opening of the pericarp and the fall of the seed. The time at which different species of seeds, after being committed to the earth, begin to vegetate, varies from one day to some years. The seeds of grasses, and the grain like plants, as rye, wheat, corn, &c. germinate within two days. The cruciform plants, such as radish, and mustard, the leguminous, as the pea and bean, require a little more time. The peach, walnut, and peony, remain in the earth a year before they vegetate.

All kinds of plants germinate sooner if they are sown immediately after being separated from their pericarps.

Most vegetables preserve their vital principle for years: some lose it as soon as they are detached from their pericarps. This is said to be the case in the coffee and tea. The seeds of some of the grasses, as wheat, &c. are said to retain their vital principle even for centuries. It is asserted that mosses kept for near two hundred years in the herbariums of botanists, have seemed to revive by being soaked in water. An American writer* says, that "seeds, if imbedded in stone or dry earth, and removed from the influence of air or moisture, might be made to retain their vegetative quality or principle of life for a thousand years." But he very rationally adds, "life is a property which we do not understand; yet life, however feeble and obscure, is always life, and between it and death there is a distance as great as existence and nonexistence."

LECTURE XVII.

Solid and Fluid Parts of Vegetables.

Having considered the organs of the plant, from the root to the seed, it might seem as if our inquiries into the vegetable substance were terminated; but we have yet to investigate more minutely the internal texture of these various organs. Before commencing the study of botany, when you looked at the trunk of a tree, a little herb, or a leaf, you perhaps considered it as very simple in its structure; you saw it only as one mass: but

the embryo as if in a germinating state: the radicle was like a little beak; in the upper part or plume was plainly to be seen the tuft of leaves and the stem.

* B. Barton.

Solid and fluid part of plants—internal structure—

you now perceive that plants, like animals, are a collection of fibres; that they have parts which are analagous to our skin, bones, flesh, and blood; that they are living, organized beings, composed of solid and fluid parts, and like animals, the subjects of life and death.

Plants differ from animals in not possessing any of the organs of sense. They can neither see, hear, taste, smell, nor touch. Some vegetables, however, seem to have a kind of sensibility like that derived from the organs of touch; they tremble and shrink back upon coming in contact with other substances; some turn themselves round to the sun, as if enjoying its rays. There is a mystery in these circumstances which we cannot penetrate, and it is not yet fully known at what point in the scale of existence animal life ends, and vegetable life commences. Some animals, like the sponge and corals, seem almost destitute of any kind of sensation, and yet they are ranked in the animal kingdom. On the subject of the distinctions and analogies between plants and animals, we shall dwell more fully hereafter.

SOLID PARTS OF VEGETABLES.

At present we have to consider the solid parts of the vegetable system; these are all composed of a *membranous substance*, which exists in every part of the plant, forming by various modifications the different textures which the vegetable system exhibits. This membranous substance appears chiefly under two elementary forms: viz. 1st, that of *cellular texture;* 2d, *vascular texture.*

1st. *Cellular texture*, according to the opinion of Mirbel, is composed of a mass of little hexagonal cells, resembling honey comb. Another French Botanist* compares the appearance of the cellular texture to the froth of fermenting liquor; he considers that each cell is disconnected with the others; while Mirbel believes that the divisions of the membrane which forms these cells, are common to contiguous cells. The cellular system in animals contains the fat; in vegetables it is generally filled with resinous, oily, or saccharine juices. In some cases the cells contain air only. They are usually marked by small dots, which are supposed to be apertures, through which fluids are transmitted from one cell to another.

* Dutrochet.

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plants analogous to animals—Difficult to determine where vegetable life commences. Solid parts of plants—membranous substance under two forms—cellular texture—how situated.

The cellular texture composes most of the pith, parenchyma and cotyledons of almost all vegetables. It is abundant in tuberous roots, pulpy and fleshy fruits, and the stems of grasses, and constitutes the principal parts of mushrooms and other cryptogamous plants. In the bark of plants, the cellular texture is situated under the cuticle; it is filled with a juice which varies in colour in different species of plants, but is most commonly green; it gives its colour to the bark, as the same texture under the human cuticle gives colour to the skin. The green colour of leaves is caused by the cellular texture, which is inclosed on both sides by the cuticle. In the pith of young plants the cells are filled with watery fluids, but in older plants they are empty or only filled by air.

The petals of flowers owe their beautiful hues to the presence of cellular texture, filled with juices, which refract and reflect the rays of light.

Vascular texture*, consists of tubes which like the vessels of the animal frame are capable of transmitting fluids. These tubes are open at both ends, and are protected by a thick coating of cellular integument; their sides are thick and little transparent. These vessels extend throughout the whole plant, distributing air and other fluids necessary to vegetation. The vascular system of plants presents a variety as to form and with respect to the functions which the different vessels perform; some are called *Moniliform*, resembling in external appearance a string of beads; these serve to connect larger vessels, and to convey sap from one set to the other. Some are *entire* vessels, or without any perforation; these convey the proper juices of the plant and are generally found containing oils and resinous juices. *Porous* vessels have their sides pierced with many perforations; they are not continuous tubes, but often separate and again unite, changing at length into cellular integument. *Spiral vessels* are so called from their form, resembling that of a screw; they are sometimes termed *trachea* from a supposed analogy to the trachea, or the organs of insects for breathing. These vessels are formed of a thread like fibre turned spirally from right to left.

Mosses, fungi, and lichens have no vascular system; but their vessels are all of the cellular kind. The fibres of plants are all composed of some varieties of the two kinds of vessels we have now described. Roots and stems are composed of fibres; these may easily be split longitudinally, as the vessels in this case are only separated, and the cellular texture easily yields: but in cut-

* The term *vascular* is derived from the Latin word *vasculum*, a little vessel.

Cause of the green colour of plants—Beautiful hues of petals—Vascular texture—Its variety of forms—Cellular integument.

ting the roots and stems horizontally, greater resistance is to be overcome, since the tubes are to be divided or cut across.

Vegetables like animals have a *system of glands*, or internal vessels which are by the author of nature made subservient to the purpose of producing changes in the fluids of the plants; thus the sap is converted into the proper juices, and from the same soil and nourishment appear plants of very different properties.

Mirbel by the aid of the microscope succeeded in discovering a *system of glands*, in the pores of cells and on the borders of the spiral vessels. There are external glands which appear manifest to the naked eye; as the nectaries of flowers, which secrete or manufacture honey; and the stings of plants, which secrete an acrid substance, that by penetrating the skin causes a painful sensation.

FLUID PARTS OF VEGETABLES.

The different fluids which are exhibited in the vegetable body may be considered under three general divisions: 1st, the *sap*; or ascending fluid; 2d, the *cambium* or descending fluid; 3d, the *proper juices*.

The *sap* is a limpid, inodorous liquid, the elements of which are imbibed from the earth by pores in the radicles of the root. You know that if the earth around the roots of plants is deprived of moisture, they soon die. Moisture furnishes to the radicles, water holding in solution various substances; such as earths, salts, animal and vegetable matter. The radicles, by some unknown process, convert this fluid matter into sap, and then by means of vessels which form what is called the *sap-wood* or *alburnum*, this sap ascends through the stems to the branches; passing through the woody part of the petioles, and those minute branches of the petiole which form the ribs and veins of the leaf, it enters into the vessels and cells which extend throughout its substance.

The ascending sap is always in circulation, but its energy varies with the season and the age of the plant. Heat has an important influence upon the ascent of the sap; yet during a dry and hot season it often appears to ascend but slowly. This is owing to the absorption of fluids from the earth, being checked by the dryness of the soil. The plant may by a little stretch of the imagination, be considered as thirsty, and thus man may seem not only provident, but humane in administering to its roots refreshing draughts of water. Even the leaves seem at such a

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Glands of vegetables—their use—Nectaries of plants—Fluids—Three divisions—Sap—From what imbibed—Alburnum.

period, to be too impatient to wait for supplies by means of the connecting sap vessels; but if water is sprinkled upon them, they fail not to use their own power of absorption, and may often be seen upon such an application almost instantaneously to revive.

When the moisture of the earth coincides with elevation of temperature, the sap ascends with the greatest rapidity; this is the case in spring. It is at this period, as you no doubt are aware, that incisions are made into the wood of maple trees in order to procure sap for the manufacture of sugar. The sap may at this time, be seen flowing almost in a stream. It has been thought that the circulation of sap was wholly suspended during winter; this however seems not to be the case; for we may observe during this season, a gradual developement of some parts of the plant; we see many plants preserving the freshness and verdure of their foliage; and mosses putting forth their flowers. We must then believe that the sap is in perpetual motion, susceptible of being accelerated or retarded by changes of temperature and humidity or dryness of the earth. The developement of buds, must be attributed to the ascension, and redundancy of the sap which dilates and nourishes their parts. In spring when the ascent of the sap is accelerated, the buds enlarge rapidly, and then complete developement is soon perfected.

The vascular texture appears by its tubes and channels to afford great facilities for the ascension of the sap. In imperfect plants, such as mushrooms and lichens, which are wholly composed of cellular texture it is not known that there is any ascent of sap, but they seem to be nourished by fluids absorbed from the air.

The question naturally arises, by what force is the sap made to ascend, contrary to the laws of gravitation? Some have asserted that this phenomenon was owing to the contraction and dilatation of the air and of the juices of the plant; some have referred it to the action of heat; and others, to the irritability of the vessels and the energy of vital power. There is still another explanation, and one perhaps more philosophical than any of the preceding: viz. that the sap rises upwards by the force of capillary attraction. You know that the vessels containing the sap have been described as very small tubes, no larger than a hair,* and in most cases much smaller, since few are visible to

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* The term capillary is derived from the Latin *capillus* a hair; meaning small, like a hair.

Influence of heat in the ascending of sap—Sap of maple trees—The period in which sap ascends with the greatest rapidity—Perpetual motion of sap—Cause of developement of buds—Philosophical explanation of the ascent of sap.

the naked eye. You have in the study of Natural Philosophy, learned that capillary tubes have the property of raising liquids against the laws of gravitation, and with a force proportional to their smallness of diameter: this law seems to explain, in some degree, the phenomonon of the ascent of the sap. Yet still, this is but a secondary cause, and we must realise that our researches, here, as in every other case, terminate in mysteries impenetrable by our limited faculties.

But it is necessary for us now to trace the progress of the sap, after it has ascended to the leaves and extremities of the plant; a considerable portion of it is by pores in the leaf, exhaled in the form of almost pure water, while the particles of various kinds which the sap held in solution are deposited within the substance of the leaf. This process is sometimes termed the *perspiration* of plants; it is visible in some grass-like plants particularly upon the leaves of Indian corn; if these are examined before sunrise, the perspiration appears in the form of a drop, at the extremity of the leaf; the ribs of the leaf unite at this point and a minute aperture furnished for this purpose, may then be observed.

The sap which remains after the exhalation by means of the leaves, is supposed to consist of about one third of that originally absorbed by the root; this remainder possesses all the nutritive particles, which had before been divided through the whole of the sap. At this period an important change in its nature takes place, a change which has its analogy in the animal economy. We have compared the sap to the blood of animals, but it is in reality more like the animal substance, chyle, which is a milk-like liquor, separated by digestion from the food taken into the stomach. A considerable part of this chyle is converted into blood, which passing first into the arteries and then into the veins, are by the latter conveyed to the heart; the heart by its contractions sends the blood to the lungs. At each *inspiration* of the breath, the oxygen from the atmospheric air is absorbed by the lungs; here uniting to the carbon of the blood, it forms carbonic gas, which is thrown off at every *expiration* of the breath. Thus the carbon, which in the animal system is accumulated, by feeding on vegetables, and which requires to be diminished, is carried off; it has been said that a person exhales, in breathing twenty four hours, almost one pound of carbon, which you know is the basis of charcoal!

We will now return to the sap in the leaves of plants and see whether a change takes place analogous to that just described as taking place in the animal system. We will consider the sap

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Researches often terminate in mysteries—Exhalation of sap—Perspiration—Sap compared to chyle—Animal chyle—Formation of carbonic gas.

as bearing a resemblance to the animal chyle, and the leaves to the animal lungs. These vegetable lungs are furnished with pores, by which they too, inhale gasses; but here our comparison fails, since instead of oxygen, the plant inhales carbonic acid; this it decomposes; and converting to its own use the carbon, which is an important element of vegetable compounds, it exhales the oxygen necessary for the support of animal life. Light however is necessary for this process of respiration in the plant; deprived of this agent, vegetables absorb instead of giving off oxygen. The carbon, which is deposited in the sap, seems, in order to be fitted for the nourishment of the plant, to require the farther agency of oxygen, to convert it into carbonic acid; this is done by means of the oxygen, which, during the light, is absorbed by the leaves. At the appearance of light, carbonic acid is again decomposed and oxygen evolved. Besides the oxygen which the plant separates from the carbonic acid inhaled by its leaves, it is undoubtedly furnished with this gas by the decomposition of water and other substances which are absorbed by the root. The cambium is the sap elaborated by the chemical process carried on in the leaves, and rendered fit for the nourishment of the plant. In tracing the descent of this returning sap, we shall not find it passing through the same vessels by which it ascended; it is chiefly conveyed by a system of vessels between the liber or inner layer of bark, and the alburnum or young wood; here it contributes both to the formation of new wood and new bark, and extending from the extremity of the roots, to the upper extremity of the plant, it furnishes materials for the formation of new buds and radicles. If a ring is cut through the bark of a tree, the cambium will be arrested in its course and accumulating around the upper edge of the bark, will cause a ridge or an *annular** protuberance. This vegetable blood being thus prevented from having access to the lower part of the plant, the roots cease to grow, the sap ascends but feebly, and the tree dies in two or three years. If the incision is not made too deep, the wound will soon heal by the union of the disconnected bark, and the circulation of the cambium proceeds as before. This experiment proves the importance of this fluid to the existence of the plant.

The *Proper Juices of vegetables.* This division comprehends all the fluids furnished by the plant except the sap and cambium; as oils, gums, &c. These are the product of the cambium, as in the animal, tears are secreted from blood. The secretions, car-

*From the Latin word *annulus* a ring.

Cambium or descending sap—Conveyed by a system of vessels—importance of this fluid—The proper juices of vegetables—Secretions of two kinds.

ried on by the vegetable glands from the cambium, are of two kinds; 1st, such as are destined to remain in the plant, as milk, resins, gums essential and fixed oils; 2d, such as are destined to be conveyed out of the plant, as useless or incongruous; these consist chiefly of vapors and gasses exhaled from flowers, and are called *excretions.*

LECTURE XVIII.

Bark, Wood and Pith.

We have exhibited to your view the minute discoveries made by the help of the microscope in the solid parts of vegetable substances; and we have also noticed those important fluids, the circulation of which appears to constitute the life, and produce the growth of plants. We have now to consider the solid parts already described as composing the body of the vegetable, and collected under the three forms of *Bark, Wood, and Pith.*

BARK.

The bark consists of the *epidermis*, *cellular integument* and *cortex.*

1st. *Epidermis* is the skin or membrane which extends over the surface of every vegetable. It is also called the *cuticle*, a name which anatomists have given to the external covering of the animal body. There is a striking analogy between animal and vegetable cuticle or skin. In the animal it varies in thickness from the delicate film which covers the eye, to the hard skin of the hand or foot, the coarser covering of the ox, or the hard shell of the tortoise. In the vegetable it is exquisitely delicate, as in the covering of a rose leaf, and hard and course in the rugged coats of the elm and oak. In the birch you may see the cuticle or outer bark peeling off in circular pieces. This seems not to be endowed with the vital principle, and in this respect, it differs from all other parts of the plant. The outer bark serves for protection from external injuries, and regulates the proportion of absorption and perspiration through its pores. It is transparent as well as porous, so as to admit to the cellular integument, the free access of light and air, while it excludes every substance which would be injurious.

Bark, Wood and Pith—Epidermis or cuticle—

It is to the cuticle of wheat, oats, rye, and some of the grasses, that we are indebted for straw and imitation of Leghorn hats. In their manufacture, the straws are scraped, so as to have nothing left but the cuticle. It has been ascertained that the outer bark of many of the grasses contains silex, or flint; in the scouring rush, (*Equisetum*,) the quantity of silex is such that housekeepers find it an excellent substitue for sand in scouring wood or metals. A singular property of the cuticle is, that it does not seem to be subject to the same changes as the other parts of bodies; it is of all substances found upon animal or vegetable matter, the least indestructible. The cuticle is sometimes like the skin of animals, clothed with wool or down, and it then becomes an important security against the effects of heat and cold. The leaf of the mullein has its cuticle covered with a kind of wool; the pericarp of the peach has a downy cuticle.

2d. *Cellular Integument*, is situated beneath the epidermis or outer skin of the bark. This substance you will recollect is composed of minute cells filled with a resinous substance, which is usually green in young plants. This cellular layer possesses glands, which when submitted to the action of the light carry on the process of decomposing carbonic acid gas, by retaining the carbon and evolving the oxygen gas. The cellular integument envelopes branches as well as trunks of trees and herbaceous stems; it extends into roots, but there it neither retains its green colour nor decomposes carbonic acid gas. It is the seat of colour, and in this respect analogous to the *cutis*, or true skin of animals, which is the substance situated under the cuticle, and is black in the Negro, red in the Indian, and pale in the American. In the leaves of vegetables, the cellular integument occupies the spaces comprised between the nerves, and is of a green colour; in flowers and fruits it is of various colours. The cellular substance of some aquatic plants is filled with air; in the pine, sumach, &c. it is filled with the proper juices of the plant. This herbaceous envelope of the trunks of trees, after a time dries, appearing on the surface in the form of the cuticle, and often cleaves off. It is renewed internally from the cambium.

The petals of flowers are almost entirely composed of cellular texture, the cells of which are filled with juices fitted to refract and reflect the rays of light, so as to produce the brilliant and delicate tints which constitute so great a portion of their beauty. The fuci, a species of sea weed, and some other plants appear to be altogether composed of cellular texture.

Cellular integument—How situated—Its use—How renewed—

3d. *Cortex.* Immediately under the cellular integument, we find the true bark, which in plants that are only one year old, consists of one simple layer; but in trunks of older trees, it consists of as many layers as the tree has numbered years. The cortex is formed of bundles of longitudinal fibres called cortical vessels.

The peculiar virtues or qualities of plants chiefly reside in the bark. Here we find the resin of the fir, the astringent principle of the oak, and the aromatic oil of the cinnamon.

The inner cortical layer is called the *liber ;* it is here only, that the essential vital functions are carried on ; this integument is called *liber*, from its fine and thin plates, which are thought to bear some resemblance to the leaves of a book, which in Latin is *liber*. This substance by its developement produces new roots, branches, leaves, flowers and fruits. It is composed of a kind of net work, which has been compared to cloth ; the elongated fibres representing the warp and the cellular texture the filling up. It has been observed that the cambium descends between the liber and the wood, and that a layer of new liber is every year made from that liquid ; as the new layer is formed the old one is pushed outward, and at length losing its vital principle it becomes a lifeless crust. The natives of Otaheite manufacture garments from the liber of the paper mulberry. The liber of flax is by a more refined process converted into fine linen. This part of the bark is important to the life of vegetables ; the outer bark may be peeled off without injury to them, but the destruction of the liber is generally fatal. The operation of *girdling* trees, which is often practised in new countries, consists, in making with an axe, one or more complete circles through the outer bark and the liber of the trunk. Trees seldom survive this operation, especially if it have been performed early in the spring, before the first flow of the sap from the root towards the extremities. During the repose of vegetation, that part of the liber most recently organised, and which of course retains its vital power, remains inactive between the wood and the outer layers of the bark, until the warmth of spring causes the ascent of the sap. After promoting the developement of buds, and the growth of new radicles, the liber hardens and becomes lifeless like that of the preceeding year.

WOOD.

The wood (*lignum*) consists of two parts, *alburnum* or sap wood, and *perfect wood.*

Cortex or true bark—Liber—Annually renewed—Wood of two parts—

The *alburnum* is so called (from *albus* white) on account of the paleness of its colour. This is the most newly formed wood and constitutes the outer part of the woody substance of the plant. It is at first soft and tender, and in this state appears to be active with the principle of life. As the liber is formed annually from the cambium or descending sap, new layers of alburnum are supposed to have the same origin, and to be formed during the same intervals of time. Most of the sap ascends through the alburnum, though some passes through the perfect wood. The sap which nourishes the buds, passes through the centre of the stem, and from thence is conveyed in appropriate vessels to the buds.

The *perfect wood*, is sometimes called the *heart;* its colour is usually darker than that of the sap wood, and its texture is firmer and more compact, it is also more durable for timber. It is formed by the gradual concentration and hardening of the alburnum. The wood constitutes the greater part of the bulk of trees and shrubs; when cut across, it is found to consist of numerous concentric layers. It is supposed that one of these circular layers is formed every year.

To prove that the wood is deposited externally from the cambium, pieces of metal have been introduced under the barks of trees that were growing, the wounds carefully bound up, and after some years on cutting them across, the layers of new wood have been found on the outside of the metal.

The strength and hardness of wood, is owing to woody fibres extending longitudinally; these fibres are chiefly of vascular texture, and contain sap, and the various secreted juices; some contain only air.

PITH.

The pith (*medulla*) is situated in the centre of the trunk and branches of plants, and is a soft spongy substance, analogous to the marrow of animals. It is composed of cellular texture. The cells which are very large in the elder, are filled with fluids when young, but in old branches the fluids disappear, and the cells are filled with air. In general, herbs and shrubs have a greater proportion of pith than trees. It is also more abundant in young than old vegetables; it extends from the root to the summit of the trunk or stem of the plant.

The *medullary* rays are lines which diverge from the pith towards the circumference; they are fibrous textures interwoven in the wood, the alburnum, and the different layers of the

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Alburnum—Perfect wood—Strength and hardness of wood.
Pith—Medullary rays—

bark. The new buds seem to originate from the points at which they terminate.

The pith has been compared to the spinal marrow in animals; it appears to be an important part of the vegetable substance, though its offices are perhaps less understood than those of the other parts.

You are not to expect that every stem, or branch of a plant will present you with all the various parts which we have described as constituting the vegetable body; neither when they exist are they always distinct, for as there is a chain of connexion between them, so they often pass into each other in such a manner as to leave their boundaries difficult to define. Many species of plants have no distinct layers of bark, and many have such a similarity between the alburnum and the perfect wood as to render a distinction very difficult.

GROWTH OF A PLANT.

Let us now take a rapid view of the growth of a woody plant. Before germination, the substance of the plume or ascending part of the embryo, exhibits a delicate and regular cellular texture; where the liber and medullary rays are to be formed, traces of cambium appear. When the germination commences, the vascular system begins to organize around the pith, and to form the medullary rays; the extremities of these rays exhibit cellular texture which is soon converted into liber. This liber at first expands, then hardens, and is at length converted into a layer of alburnum; this alburnum gradually acquires tenacity; the cells appear merged into vessels of a firmer kind and it is no longer a layer of alburnum but of perfect wood. While this change is taking place, the cambium, which may almost be termed a fluid cellular texture, flowing between the bark and the wood, reproduces a new layer of liber, which in its turn becomes alburnum and then perfect wood; to this succeeds a third and fourth layer, and thus the growth of the vegetable goes on until death completes its term of existence. Each layer of wood is generally the product of one year's growth; but it is only near the base of the trunk, that the number of layers of wood is a criterion of the age of the tree; for in trees where one hundred layers may be counted near the base, no more than one can be found at the extremity of the branches. These layers then do not extend through the length of the tree; but while

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Pith compared to the spinal marrow in animals—Various parts not always distinct in different plants.

Growth of a plant—Its commencement and progress to the formation of wood—

the base exhibits all the layers which have been formed, the extremity of the branches contains under the bark only the continuation of an annual layer.

We can now show you how the tree grows in height as well as circumference. A seed germinates; the ascending part rises; the liber, by the vegetative power, is urged upward; but in developing, it gradually becomes less capable of extension; at length, when it is converted into wood, its growth ceases. The layer of wood then exhibits the form of an elongated cone; at the summit of the cone a bud is formed, from which a new shoot issues; a new liber organizes upon the surface of the cone; this new liber in turn, becomes a woody cone covering the one first formed; and thus the tree goes on increasing in height and in diameter. The terminal bud is formed each successive year. After a hundred years of vegetation a hundred cones might be found boxed into each other in the manner first described; the spaces comprised between the summits of the cones would shew the succession and elongation of the annual shoots.

As the wood is formed by the conversion of the cambium into the alburnum, so from the same liquid, the inner layers of bark are formed which renew the waste occasioned by the destruction of the epidermis. While the tree is growing inward, that is from the alburnum towards the pith, the bark is growing outward, or the inner layers are pushing to the surface.

The growth of trunks, which we have hitherto considered, has relation only to woody plants. But there is a marked difference in the growth of plants, which seems to originate in the peculiar formation of their seeds. You will recollect that in the description given of the seed, it was observed that some seeds have but one cotyledon; others two, and a few more than two. Between plants which grow from seeds, with one cotyledon, and such as grow from seeds with two cotyledons, there is a great difference as to the mode of organization.

The first kind of plants are called *monocotyledonous*; the second, *dicotyledonous.* Their stems, on account of their different modes of growth, have been distinguished into *endogenous* signifying to grow inwardly; and *exogenous*, signifying to grow outwardly. The discovery of the different modes of growth in these two great divisions of plants, is of recent origin, and constitutes an important era in vegetable physiology.

The stems of monocotyledons, or endogenous plants have seldom a bark distinct from the other texture; they have no liber, or alburnum disposed in concentric layers; they have no

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Advance of the tree in height as well as circumference—Remarks on the different organization of plants—Of Monocotyledons—Dicotyledons—Stems distinguished into endogenous and exogenous–Growth of endogenous plants.

medullary rays; and their pith, instead of being confined to the centre of the stem, extends almost to the circumference. The wood is divided into fibres, running longitudinally through the stem; each of these fibres seems to vegetate separately; they are ranged around a central support; and are so disposed that the oldest are crowded outwardly by the developement of new fibres in the centre of the stem; this pressure causes the external layers to be very close and compact. This mode of increase little favorable to growth in diameter, produces long and straight stems which are nearly uniform in their size, throughout their whole extent; as the palms and sugar-canes of the tropics, and the Indian corn of our climate. Most of these plants present us with roots of the fibrous kind.

Dicotyledons are called *exogenous* plants, because their stems grow from without; that is, the wood grows externally, and each succeeding layer presses upon the central ones; thus the exogenous plants are more hard and compact towards the centre; as in the oak; while the endogenous plants are more firm in their external parts; they continue to increase in height, long after they cease to grow in diameter. The stem is gradually extended upwards by new terminal shoots, which are formed annually. The epidermis is formed of the foot stalks of leaves which annually sprout from the rim of a new layer of wood; the leaves falling in autumn, their foot-stalks become indurated and incorporate themselves into the outer surface of the plant.

We have now taken a brief view of the most important facts and principles which constitute the science of vegetable physiology including anatomy. That you may have found the subject somewhat tedious, need give you no apprehension that your minds are not fitted for minute investigations. The most scientific observer of nature, cannot but feel, with yourselves, that after all his scrutiny, organic life is shrouded in mystery. Although the vegetable structure is less complicated than the animal, there are many analogies between them; and many parts of the former have been named, and various phenomena explained, by a reference to names and principles common to animal anatomy and physiology. You cannot therefore expect, at the first glance, to comprehend explanations which presuppose some knowledge of those intricate subjects. By attention to the vegetable structure, you will, doubtless, be induced to think more upon the wonderful mechanism of your own material frames, and upon the great resemblance, yet infinite difference between yourselves and the trees of the forest, and the lilies of the field.

You will, in the language of the Psalmist, be led to exclaim,

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Why Dicotyledons are termed exogenous—Formation of epidermis—

"Oh Lord, how manifold are thy works, in wisdom hast thou made them all!" You are nourished by the same elements as the grass that perisheth; the flowers have a much more refined corporeal substance than belongs to you; and yet how much more precious are you in the sight of the Almighty than the vegetable creation.

Do you ask, why you are of more value "than the lilies of the field," or than "many sparrows?" It is the very principle within you which enables you to make this inquiry, that renders you thus precious; it is your soul that raises you above the inanimate and brute creation. Your body is but sister to the worm, and noxious weed; but your soul may aspire to the fellowship of angels, and to be an inhabitant of heaven. Take not then your chief thought for the perishable part, but seek to render the soul worthy of its high destiny.

LECTURE XIX.

VITAL PRINCIPLE.

We have now, according to our method of arrangement, considered the anatomy of the vegetable in connexion with its physiology: that is, when treating upon each particular organ, we have remarked upon its uses in the *life* and *growth* of the whole plant. We have treated of the germination of the seed, the minute vessels which constitute the vegetable fabric, with the fluids which circulate through these vessels; we have, as it were, gathered these vessels together and considered them as constituting in various ways, three essential parts of woody plants, the bark, wood, and pith. We have inquired into the manner in which these separate parts are formed, and observed the great distinction in the growth of the stems of monocotyledonous and dicotyledonous plants.

Yet although we have seen how plants *grow*, it is no easy thing to explain how they *live*. The great principle which operates in organic life, appears not to have been laid open to the eye of man. But by a careful observation of facts, we can learn all that it is important for us to know in order to cultivate plants successfully; their habits, food, and the causes of their diseases and death.

The physician who spends a long and laborious life in the study of the human frame, can give only the result of *observa-*

The wisdom of the Creator manifest in his works—Reflection—Limits to the study of the human frame—Retrospective view—

tions, made by himself or others. He finds a certain article efficacious in the relief of a particular disease; but he knows not why this should be so; or if he is able to give some reasons, he is ultimately arrested in his speculations by a barrier which he cannot pass. Thus he knows that soda or pearl-ash correct acidity in the stomach; ask the reason of this, and he tells you that these are alkalies, substances which neutralize acids, and thus render them harmless; inquire still farther, why alkalies do thus affect acids, and the physician is as ignorant as yourselves.

Chemical Composition of Plants.

Before closing our view of the vegetable structure, we shall, by the aid of chemistry, examine the elements which compose it.

The growth of vegetables, and the increase of their weight, show that they imbibe some external substances, which are incorporated into their own substance. This constitutes *nutrition*, and distinguishes living substances from dead matter. A stone does not receive nourishment, although it may increase by an external accumulation of matter. "Vegetable substances, analysed by a chemical process, have been found to contain *carbon*, *oxygen*, *hydrogen*, and sometimes *nitrogen*, *sulphur*, *silex*, (a flint-like substance,) the *oxide of iron*, *soda*, *magnesia*, and *chalk*.*" These different substances are by the root, stems, and leaves of the plant, derived from the earth, air, and water.

PROXIMATE PRINCIPLES.

Vegetation produces chemical combinations which are distinguished by the name of proximate principles. Although the proximate principles of plants are very numerous, but few of them are well known; they are the result of the action of the vital forces of plants, and are, therefore, important subjects of investigation to those who pursue the study of physiological botany to any great extent. *Carbon*, *oxygen*, *hydrogen*, and *nitrogen*, are the constituent parts of the proximate principles of plants. These principles may be divided into two classes.

I. Those principles which are composed of *carbon*, *hydrogen* and *oxygen*, without any nitrogen.

II. Such as contain, besides the substances belonging to the other class, some *nitrogen*. There are few of this class.

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* Mirbel, "Elemens de Botanique."

Chemical composition of plants—Examination of the elements which compose the vegetable structure—Proximate 'principles—Chemical relation—Chemical composition of the sap—Variety of combinations formed by a few elementary principles—Proximate principles divided into two classes—

The first class is divided into *three orders.*

1st. Principles which have more *oxygen than sufficient to form water.*

2d. Principles in which oxygen and hydrogen exist *in the exact proportion to form water.*

3d. Principles where *hydrogen is in excess.*

The 1st order includes *vegetable acids*: as,

Acetic acid, or pure vinegar; this is generally produced by fermentation from wine, cider, and some other liquids; it is also found in a pure state in the campeachy wood, and the sap of the elm.

Malic acid may be extracted from green apples and the barberry.

Oxalic acid is found in several species of *sorrel*, belonging to the genera Oxalis and Rumex.

Tartaric acid is obtained from the tamarind and the cranberry; this acid, combined with potash forms what is commonly called cream of tartar.

Citric acid is found in the lemon; it is mixed with the malic acid in the gooseberry, the cherry and the strawberry.

Quinic acid is obtained from the peruvian bark, (*Cinchona.*)

Gallic acid is obtained from the oak, and the sumach; it is highly astringent.

Benzoic acid is found in the Laurus *benzoin*, and in the Vanilla; this is highly aromatic; it is thought to give the agreeable odour to balms.

Prussic acid; this acid gives out a strong odour like bitter almonds; it is an active poison; it is obtained from peach meats and blossoms, from bitter almonds, &c.

The 2d order includes gums, sugar, &c.

The Gums; of these there are many kinds; they have neither taste nor smell; dissolved in water, they form a mucilage more or less thick. The principal gums are,

Gum Arabic, which flows from the plant Mimosa *nilotica;*

Common Gums, such as issue from the peach tree, the cherry tree, and many others.

Sugar is a substance which dissolves in water, and has a sweet taste; it is obtained from the sugar cane, the sugar maple, from the stalks of indian corn, pumpkins, beets, and sweet apples. All vegetables which have a sweet taste may be made to yield sugar.

The 3d order includes *oils*, *wax*, *resins*, &c.

Oils. These are fluid and combustible substances which do

First class divided into three orders—First order includes vegetable acids—Second order, gums and sugar—Third order, oils, &c.—

not unite with water. They are divided into *Fixed* and *Volatile.* The Fixed oils are thick and have little odour.

The oil of sweet almonds, and *olive oil* grow thick and opaque by being exposed to the air.

The *Oil of Flax Seed,* called linseed oil, and some other oils, dry without losing their transparency; it is this quality which renders linseed oil so valuable to painters.

The *Volatile oils,* are distinguished from the fixed oils by their aromatic odors, and their tendency to fly off, from which circumstance the term *volatile* is derived. Some of these oils are those of the orange, lavender, rose, jasmine, peppermint, and wintergreen. These oils are sometimes greatly reduced by being mixed with alcohol, and are then called essences. The volatile oils may be found in a great variety of plants, particularly those of the Labiate family.

The *Aroma,* or *aromatic property,* consists chiefly of the odors which are exhaled from plants, containing volatile oil; it is this oil which throws out the aromatic odour of the ginger plant, of the myrtle, rose, and other sweet scented plants. Aromatic plants are much more common in hot, than cold countries; most of our aromatic spices are found in the equatorial regions.

Wax is found on the surface of the fruit of the bay-berry, (MYRICA *cerifera.*). Beeswax is an animal production, made by the bees from pollen or farina of plants.

Camphor has much analogy with the volatile oils; it is an extract from the LAURUS *camphora,* or camphor tree of Japan.

RESIN exudes from the pine, and some other trees; it is dry, insoluble in water, but soluble in alcohol and very inflammable.

The people in new countries often use, as a substitute for lamps, pine knots, which, abounding in resin, burn with a bright flame.

The difference between resin and the volatile oils, appears to consist in the action of oxygen upon the resin; for the oil in absorbing oxygen from the air, passes into the resinous state.

Resins mixed with volatile oils form balsams; thick, odorous, and inflammable substances of this kind are the balsam copaiva, dragon's blood, which, notwithstanding its terrific name, is but the simple extract of a plant, (DRACŒNA *draco ;*) the balsam of *Tolu* is the extract of the TOLUIFERA *balsamum.*

These resins are sometimes mixed with gums, they are then called gum-resins; of this kind are gamboge, assafœtida, guaiacum, aloes, an extract from the ALOE *perfoliata.* These gum-resins in flowing from vegetables are sometimes white and liquid

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Third order, oils, &c.

like milk, but they usually become brown and hard by exposure to the air.

Indian rubber,* or as it is sometimes called, gum elastic, is the product of a South American tree, called the Siphonia elastica, an East Indian plant, the Urceola *elastica*, and some other trees in the equatorial regions; by exposure to the air it hardens, becomes brown, and takes the appearance of leather; it can neither be dissolved by water nor alcohol. The juice of the milk weed is said to be similar to that of the Siphonia elastica, and that of other plants from which the Indian rubber is made.†

The green principle; it is to this principle that all the green parts, exposed to light, owe their colour; it undergoes changes in the different states of the plant, in autumn becoming brown or yellow. Davy attributes the change of colour, to the formation of some acid; you know that a drop of sour wine, lemon juice, or any other acid, will turn green to a brown or yellow colour.

II. *Second class of Proximate Principles.*

The 2*d* class of proximate elements are formed of carbon, hydrogen, and oxygen, which also compose the preceding class; but to this is added nitrogen.—In this class we find,

Opium, a narcotic principle, extracted from the poppy. It is soluble in alcohol, slightly soluble in water.

Hematine; this is the colouring principle, from the *campeachy wood.*

Indigo, a colouring substance, obtained from several species of Indigofera, or the indigo plant.

Gluten, is extracted from the cotyledons of the seeds of *leguminous* plants; as peas, beans, and from the albumen of wheat, rye, &c. It is obtained by separating it from the starch; flour owes much of its nourishing properties to gluten; which in some respects is analogous to animal principles, and like them, is subject to putrefaction.

Jelly is the thickened juice of succulent fruits; as currants, quinces, and apples; it is soluble in hot water, though scarcely so in cold; when heated, it loses its jelly like form, which is that of a coagulated mass, between a liquid and a solid, susceptible of a tremulous motion; by long boiling, the juice loses the property which gives to jelly its peculiar appearance. Many

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* Caoutchouc.

† Mr. H. Eaton, assistant professor at the Rensselaer Institution, prepared a small quantity of the juice of the milk weed (Asclepias) in such a manner that it could not be distinguished from the imported Indian rubber, either in external appearance, or in its properties.

Second class of proximate principles or elements.

colouring principles have never been separated from the substances to which they are united; as those of saffron, logwood, &c.

It has already been suggested, that the red colour of fruits, arises from the combination of an acid, with a blue colouring principle; you know that the effect of mixing any acid with an infusion of blue violets, or any vegetable blue, is to give a red tinge, varying in shade from a purple red to a brilliant scarlet, in proportion to the quantity of acid.

It has also, upon the same principle, been supposed that the purple, red, and blue colouring of the petals of flowers is owing to different proportions of acid; this may explain the change of colour which appears in some flowers, which pass from blue to red; as the changeable hydrangea. This change may be attributed to increase of acid combining with the blue colouring principle.* Some red flowers become blue; they are in this case supposed to have parted with some portion of the acid, which was united with their colouring principle.

Chemical composition of the Sap.

The sap is a transparent, colourless fluid, imbibed by the vegetable from the earth and air; or more properly, from the water existing in them, which holds in solution oxygen, hydrogen, carbon, nitrogen, earths, mineral salts, and animal and vegetable matter. We might suppose, that being derived from the same source, the sap in all vegetables would be alike, but it is never obtained pure; it is mingled with the *proximate principles*, or proper juices, and thus differs in different species of vegetables; water, however, constitutes the principal part in all.

The following result of the analysis of the sap of some vegetables has been offered by a French chemist.†

Sap of the *elm*, (ULMUS *campestris*,) water, volatile matter, acetate of potash, carbonate of lime, vegetable matter, sulphate of potash.

Sap of the beech, (FAGUS *sylvatica*,) water, acetate of lime, with excess of acid, acetate of potash, gallic acid, tannin, mucous extract, acetate of alumine.

Sap of the Horse Chesnut, (ÆSCULUS *hippocastanum*,) water, extractive mucous matter, nitre, acetate of potash, and carbonate of lime.

These few examples of the decomposition of vegetable prin-

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[*] Iron is supposed to be combined with the oxygen of the acid.

[†] *Vauquelin.*

Cause of the red colour of fruit—

ciples show how wide a field is open to the chemist, in the study of vegetable elements.

It may seem wonderful, that of so few elementary substances, such a great variety should exist, in the taste, smell, colour, consistence, medicinal and nutricious qualities of vegetable combinations; is it not equally wonderful that, with the nine digits and the cypher, we may make such varied combination of numbers; or with our twenty six letters of the alphabet, form every variety of composition? Thus, by the various combinations of a few simple principles, are formed all vegetable and animal productions; and, although formerly, the presence of nitrogen was considered as a test of animal substance, and the want of it, of a vegetable substance, it is now ascertained that animal substances may exist without nitrogen, and that this principle is contained in several vegetable substances.

The elements of the compounds being the same, the question naturally arises, what causes the great diversity in the properties? Two causes may be assigned in answer to this question, viz. 1st. The different proportions in which the elements are combined. 2nd. The various modes of their combination.

In vinegar and sugar, the one substance a liquid, and of a sour taste; the other solid and sweet, are found the same elements in *different proportions* and *differently combined.* In gum, starch, and sugar, the *elements are the same*, the *proportions nearly the same*, but *they are combined differently.*

When we know by chemical analysis, the combinations which exist in inorganized bodies, we can by putting the same together, often form similar substances; but we cannot thus form organized bodies; for to these belongs a living principle, which it is not in the power of man to bestow. It is said that Rosseau declared he would not believe in the correctness of the analysis of vegetable or animal substances, until he should see a young animal or a thrifty plant spring into existence, from the retort of a chemist. But the power to *create*, the Almighty has not delegated to man; neither is it to be supposed that any future discoveries in science, will ever confer it upon him. To study into the compound nature of substances, to classify, arrange, and by various combinations to beautify the world of matter; to cultivate the faculties of mind, until stronger and brighter, the mental vision sees facts and principles before invisible; these are the high privileges bestowed on man; but *to add one new particle to matter, or one new faculty to the mind, is beyond the power of the whole human race.*

PART III.

CLASSIFICATION.

Note. As the pupil, in the first part of this volume, is introduced to a knowledge of the leading principles of the Linnæan system; some repetition must necessarily occur in the following part, in which the principles of classification are to be more fully considered.

LECTURE XX.

Method of Tournefort.—System of Linnæus.—Method of Jussieu.—Natural Method of Linnæus.

Let us now imagine the whole vegetable kingdom, comprising innumerable millions of individual plants, to be spread out before a botanist. Could he, in the course of the longest life, number each blade of grass, each little moss, each shrub or even each tree? If he could not even count them, much less could he give each one a separate *name* and *description.* But he does not need to name them separately, for he sees that nature has arranged them into sorts or kinds. Were you sent into the fields to gather flowers of a similar kind, you would need no book to direct you to put into one parcel all the red clover blossoms, and into another the white clover; while the dandelions would form another group. These all constitute different *species.* Nature would also teach you that the red and white clover, although differing from each other in some particulars, yet bear a strong resemblance. By placing them together you form *a genus*, and to this *genus* you refer all the different kinds or *species* of clover. When you see the red, damask, and cinnamon roses, you perceive they all have such strong marks of resemblance as to entitle them to be placed together in one genus. But yet you know that the seed of a damask rose would never produce a red rose. One species of plants can never produce another species, however near may be their resemblance.

The whole number of species of plants which have been named and described, including many which have been recently discovered in New Holland and about the Cape of Good Hope, is said to be 56,000.*

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* According as recently reported by the Baron Humboldt, to the French National Institute.

Classification—Nature arranges plants into kinds or sorts—Number of known species.

If species of plants were described without any regular order, we could derive no pleasure, and very little advantage from the study of practical botany. If we wished to find out the name of a plant, we might be obliged to turn over the leaves of a large volume, without any rule to guide us in our search.

The necessity of some kind of system was so apparent, that many attempts for the methodical arrangement of plants were made before the time of Linnæus; but his system was so superior to all others, that it was no sooner published to the world, than it was adopted by the universal consent of all men of science.

Previous to this time, Tournefort, a native of France, had published an ingenious method of arrangement, beautiful by its simplicity, but imperfect, on account of the vagueness of its application. Tournefort made twenty two classes; these he subdivided into sections or orders.

The characters of his classes were founded upon the *absence*, *presence*, and *form* of the corolla.

The first *seventeen* classes contained *herbs* and *shrubs ;* the remaining ones contained *trees*.

The first four classes had *monopetalous corollas ;* they were Bell-form, Funnel-form, Labiate, and Personate.

The seven following classes contained the *Cruciform*, *Rosaceous*, *Umbelliferous*, *Caryophyllous*, *Liliaceous*, *Papilionaceous*, and the *Anomalous*.

The three following included the *Compound flowers*.

The three next following, included ;

1st. Plants having *Stamens without a corolla*.

2d. Such as had *no flower*.

3d. Such as had *neither flower* nor *fruit*.

These were the first seventeen classes of Tournefort.

Next followed his arrangement of large and small trees.

The eighteenth and nineteenth classes were *Apetalous*, having corollas without petals, and *Amentaceous*, having flowers in a catkin ; as the chesnut and willow.

The twentieth class contained such large and small *trees* as had *monopetalous corollas*.

The twenty first and twenty second contained such large and small trees as had *polypetalous* corollas ; *Rosaceous*, as the apple and lilac, or *papilionaceous* as the locust.

Necessity of order in description—Attempts at arrangement made before the time of Linnæus.

Synopsis of the method of Tournefort.

HERBS.

FLOWERS PETALOUS.	simple	Corollas monopetalous.	Regular.	1	*Bell-form.*
				2	*Funnel-form.*
			Irregular.	3	*Personate.*
				4	*Labiate.*
		Corollas polypetalous.	Regular.	5	*Cruciform.*
				6	*Rosaceous.*
				7	*Umbelliferous.*
				8	*Caryophyllous.*
				9	*Liliaceous.*
			Irregular.	10	*Papilionaceous.*
				11	*Anomalous.*
			Composed.	12	*Flosculus.*
				13	*Semi-Flosculus.*
				14	*Radiated.*
Without petals, or apetalous.				15	*Apetalous with stamens.*
				16	*Apetalous without stamens.*
				17	*Apetalous without flowers or fruit.*

TREES.

	Without petals.	18	*Trees apetalous.*
		19	*Trees amentaceous.*
Flowers petalous.	Corollas monopetalous.	20	*Trees with monopetalous flowers.*
	Corollas polypetalous.	21	*Trees with rosaceous flowers.*
		22	*Trees with papilionaceous flowers.*

After having derived from the corolla the distinctions of classes, Tournefort subdivided them into orders, or as he called them, sections. These orders were founded upon the observation of the pistil, calyx, fruit, &c.

The first step in this classification was wrong. The distinction between a small tree and shrub, cannot be accurately defined; there are many plants which we should doubt whether to class among large shrubs or small trees. Two circumstances were relied on as a foundation for this distinction; viz, that shrubs do not form buds for the future year; and secondly, the size of the plant. With respect to the formation of buds, the distinction is not found to be invariable, as some shrubs do form buds, and some trees do not. With respect to size, the variation, even in the same species, is such, in different soils and situations, that it cannot be admitted as a mark of distinction.

Tournefort's method—Defects in his classification.

Different species, even in the same genus, sometimes differ in their stems; some being woody and others herbaceous. Neither is the form of the corolla to be depended on; even in the most natural families of plants, we find flowers of different forms, as in different species in the natural order Solaneæ, where the mullein is wheel-form, the tobacco funnel-form, and the atropa bell-form.

SYSTEM OF LINNÆUS.

We shall not now attempt to give a view of the system of Linnæus, as we are hereafter to consider it in detail. We introduce it here merely to compare it with other modes of classification. The removing of plants which are nearly allied in their natural character, to different classes, by means of any artificial principle of classification, ought as far as possible to be avoided; and although the system of Linnæus, as you will find, when we compare it with natural families, is not wholly free from this confusion, it is much more so than any other which has been invented.

Although we do not now receive the method of Tournefort, for practical uses, a knowledge of it may extend your views of botanical science. When we accustom ourselves to take but one view of a subject, we are in danger of acquiring a contracted mode of thought. We are not to suppose that the system of Linnæus is entirely perfect; but may well imagine that men of science will arise, who shall discover principles now hidden, and look back upon what they will call, the very imperfect state of our sciences. We should rejoice that the human race is thus destined to a degree of improvement beyond our highest powers of calculation.

"What should we think of a savage, if, in the pride of his ignorance, he was to conceive his own thoughts and feelings to be the noblest of which the human intellect is capable? And perhaps even the mind of a Newton, is but the mind of such a savage compared to what man is hereafter to become."*

The system,† of Linnæus has already in its principal features

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* Brown.

† *System* differs from *method* in having but one single primitive character, and in founding its principal divisions upon the consideration of only one single organ or principle. Linnæus founded his system upon the consideration of the *stamens* as more or less numerous, upon their proportion, connexion, and their absence. Newton founded his system of Natural Philosophy upon *attraction;* the *vital principle* is the foundation of all sys-

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System of Linnæus not entirely perfect—Advantages of taking different views of a subject—Human mind destined to progressive improvement—Difference between system and method, (see note.)

been laid before you, in the views of artificial classes and orders.* This system not only includes within it all known plants, but is founded on such principles as must comprehend within it whatever plants may yet be discovered. The author of this system believed that no plant was destitute of stamens and pistils: but at the same time, that there were species in which these organs were so small, so obscure, or of such a singular formation as to render it difficult, and sometimes impossible to be certain of their existence, except by the principle of analogy. Therefore, he made the two grand divisions of plants *Phenogamous*, such as have stamens and pistils *visible*, and *cryptogamous*, stamens and pistils *invisible*.†

The following comparison has been very properly given by Botanists, as an illustration of the divisions in the system of Linnæus.

Classes are compared	to States.
Orders,	to Towns.
Genera,	to Families.
Species,	to Individuals.

You must not forget while considering this system, that plants themselves are the only real substances; species, genus, order and class, are mere abstract terms, denoting certain distinctions which would equally have existed, although we had never observed them, or given them names.

An *Individual* is an organized being, complete in its parts, distinct and separate from all other beings. An oak, a rose, and a moss, are each of them individuals of the vegetable kingdom.

Species include such individuals as agree in certain circumstances of the roots, stems, leaves and inflorescence. We have no reason to suppose that any new species, either of animals or vegetables, have been produced since the creation. We sometimes see *varieties* in plants made by cultivation; the stamens and pistils, from excess of nourishment, expanding into petals. Varieties are also occasioned by strewing the pollen from one species, upon the stigma of another; but these varieties do not produce perfect seed, and therefore cannot reproduce themselves by their seed. The colour, taste and size, are not considered as marks of specific difference.

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tems of Physiology. *Method* is not confined to the consideration of one character, it employs all such as are conspicuous and invariable; this is called the Natural Method, and system is called the Artificial Method. Linnæus published his system of Botany in 1734, nearly half a century after Tournefort.

* See part I. page, 28.

† Mirbel believes there are some plants absolutely destitute of stamens and pistils; these he calls *agamous*.

System of Linnæus provides for the classification of such plants as are yet to be discovered—Illustrations of its divisions—Individual—Species.

A *Genus* comprehends one or more species grouped together on account of some resemblance in situation, proportion, and connexion of the organs which constitute the flower.

Any one species of a genus may be regarded as a type or example of the others; we may easily refer species which we have not studied to their proper genus, by a knowledge of any one species of that genus. Some genera appear to be distinctly marked by nature; the various species of the rose, form a beautiful genus which is known to all, although every one might not be able to describe it to others, in such a manner as to be understood; it is chiefly distinguished by its urn-shaped and fringed calyx.

The Generic names of plants are derived from various circumstances; in some cases from a peculiarity of form or color of the corolla or some property of the plant, and some are named from distinguished persons.

Thus Iris, (flag,) is named from Iris the rain bow, on account of its various shades of colour.

Digitalis, (fox-glove,) named from *digitus*, a finger on account of the shape of its corolla, like the finger of a glove. Convallaria, (lily of the valley,) named from a Latin word *convallis*, signifying valley.

Teucrium (germander,) named in honor of Teucer, a Trojan prince who is said to have discovered this plant. The English name, germander, is supposed to have originated from the word Scamander, the name of a river of ancient Troy.

The name of the great Linnæus is commemorated in a beautiful and modest flower, called the Linnæa borealis.* Specific names are generally *adjectives*; generic names are *nouns*. The specific name sometimes indicates the number of leaves as ORCHIS *bifolia*, (bifolia, signifies two leaves,) or the color of the corolla; as VIOLA, *tri-color*, (three colored violet,) or the form of the root; SOLANUM *tuberosum*; (solanum with a tuberous root;) specific names are also derived from the names of persons; thus a species of Origanum is named *tournefortii*, after its discoverer Tournefort.

*This word *borealis* signifies northern in reference to the country which gave birth to Linnæus. This plant is not uncommon in New England and has been found on an Island in the Hudson near Troy.

Genus—A knowledge of one species in a genus enables us to recognize all other species of the same genus—Derivations of generic names—specific names adjectives—Generic names nouns—Natural methods of classification—

METHOD OF JUSSIEU.

The natural method consists in bringing together such plants as seem by nature to be constituted one family, resembling each other in general appearances and medicinal qualities; as lilies, herbs, trees, mosses and ferns. Some of these natural families show a similarity in form and quality, and are evidently distinct from all others. If the whole vegetable kingdom could thus be distributed into natural tribes, we should need no other system than that of nature. But as we proceed on this plan we soon find difficulties; for after selecting a few families which nature seems to have formed with striking marks of resemblance, we find others more obscure, and we at length see a vast number of plants which cannot be referred to any natural families.

There are two natural methods of Classification, viz. those of Linnæus, and Jussieu; the arrangement of the latter is highly valuable to those who wish to pursue the study of Medicinal Botany.

The characters employed in this method are,

1. *The structure of the Seed.*
2. *Insertion of the Stamens.*
3. *Absence, presence, and form of the Corolla.*
4. *Union or separation of Stamens and Pistils.*
5. *Union or separation of the Anthers.*

1. *The Seed*, considered with respect to *Cotyledons.*† A plant without cotyledons is called, *A'cotyledonous*, with one, *Mono'cotyledonous*, and with two, *Di'cotyledonous.*

2. The *Stamens* are inserted above the germ, *under* the germ, or *around* the germ: the 1st. is *Epi'gynous*, the 2d. *Hypo'gynous*, the 3d. *Peri'gynous.*

3. *A'petalous*, having no corolla, *Mono'petalous*, all of one piece, or *Poly'petalous*, many petals.

4. *Mono'clinious*, Stamens and Pistils on the same corolla, *Di'clinious*, Stamens and Pistils on different corollas.

5. Anthers *distinct*, or anthers *joined.*

The phenogamous plants are comprehended under 11 classes. The Cryptogamous plants or such as have no cotyledon, compose one class.

† The Cotyledons are the thick parts of the seed; an apple seed, an orange seed, or a bean, may be easily split into two parts, these are the cotyledons; rice and wheat cannot be thus split, they have but one cotyledon.

Many plants cannot be referred to any natural families—Natural orders of Jussieu comprehended under 11 classes—

SYNOPSIS OF JUSSIEU'S CLASSES.

				CLASS
ACOTYLEDONS.				1
MONOCOTYLEDONS.		Stamens *hypogynous.*		2
		" *perigynous.*		3
		" *epigynous.*		4
DICOTYLEDONS.	*apetalous.*	Stamens *epigynous.*		5
		" *perigynous.*		6
		" *hypogynous.*		7
	monopetalous.	Corolla *hypogynous.*		8
		" *perigynous.*		9
		" *epigynous.*	anthers combined.	10
			anthers distinct.	11
	polypetalous.	Stamens *epigynous.*		12
		" *hypogynous.*		13
		" *perigynous.*		14
	diclinious.			15

The Natural Orders of Jussieu are 100. They are as yet, obscure and undefined in many particulars.

The plants which have but one cotyledon, are divided into three classes; they include the *grasses*, the *palms*, *liliaceous* plants, &c.

The plants with two cotyledons are divided into 11 classes; these include all remaining plants, except some genera which appear so ambiguous in their character, as to render it doubtful where to give them a place in the Natural Orders.

In the three methods of classification which we have now examined, the most important characters of the plant have been presented, under circumstances, calculated to give you more clear ideas of them than could have been obtained from a consideration of any one method alone.

Tournefort makes you acquainted with the different appearances of the corolla.

Linnæus, of the stamens and pistils.

Jussieu, of the cotyledons and insertions.

The method of Tournefort cannot be relied on because the forms of corollas vary into each other; that of Jussieu, consider-

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The three methods of classification considered, present the most important characters of the plants under different points of view—Comparison of these methods—

ed as a study in itself, is much too abstract; the number of cotyledons, generally speaking, is an excellent character, but you cannot in the beginning appreciate its value; and as to insertion, botanists themselves are sometimes embarrassed to decide respecting it. This method, although much admired has been little used; on the contrary, the methed of Linnæus has been for half a century the foundation of all teaching. The new species discovered have been arranged according to its principles of classification, and most catalogues of plants and floras* have taken this method for their guide.

The characters used in this system are very apparent; and as it refers to the *number* of parts, rather than to their *forms* or *insertion*, it offers to the mind something positive, which is not found either in the method of Tournefort, or that of Jussieu. Between a corolla, bell form or funnel form, there are many intermediate forms which may be as much like one as the other. The insertions *over* the germ or *under* the germ are distinct, but between them, is the insertion *around* the germ, which sometimes blends with one, sometimes with the other. But between *one* or *two stamens*, or *one* or *two pistils*, there is *no intermediate step*, or gradual blending of distinctions, which leaves you in doubt whether the case before you belongs to the one or the other.

The natural orders of Linnæus are 58; they are not founded upon any one principle, but upon general marks of resemblance. This great man did not view his *Natural Orders* as approaching to a perfect classification; he modestly termed them "Fragments of a natural method." As every thing left by him on the subject of botany seems deserving of consideration, his Natural Orders are preserved as a relic, which it would be almost sacrilege to destroy: there is in them more of simplicity than in those of Jussieu, and they may be better understood by the young student.

Linnæus, in his "Philosophy of Botany," has established these kinds of characters to be used in descriptions of plants.

1st. *Factitious.* That which is, by agreement, taken as a mark of distinction: thus the number of stamens and pistils is fixed upon for distinguishing some of the classes and orders. Although nature has formed these organs, the arrangement of plants by their names, is an invention of man or *artificial.*

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* The term flora is often used for the title of a book describing plants. The ancient heathens imagined a goddess called Flora, who they thought presided over flowers.

System of Linnæus offers something positive—Natural orders of Linnæus—Three kinds of characters to be used in descriptions of plants—Factitious character.

2d. *Essential Character.* That which forms a particular character of one genus, and distinguishes it from all other genera.

3d. *Natural Character.* This is difficult to define, but it is that which is understood by all; it is the general aspect and appearance of the plant which enables all persons to make a kind of arrangement of plants in their own minds, although they would find it very difficult to convey their ideas of classification to others.

It is by their natural characters that persons who have never perhaps heard of such a science as zoology or the classification of animals, are enabled to distinguish ferocious beasts from domestic and gentle animals; they see a sheep or a cow, although that individual one they may never have seen before, without any terror, for nature teaches them at once to consider that as resembling other sheep and cows which they know to be inoffensive.

This natural character teaches savages to distinguish among the many plants of the forest, those which may administer to their wants and those which would be injurious.

Even the lowest grade of animals appear to have this faculty of selecting by natural characters nutritious substances, and avoiding noxious ones. How often do animals, feeding in pastures which contain poisonous plants, pass them by, to seek the grass which seems made for their use, and this instinct is kindly given for their preservation.

LECTURE XXI.

Comparison of Natural and Artificial Classes. Characters used in classification.

A natural family is composed of several genera of plants which have some common marks of resemblance, and its name is usually founded upon this general character; as Labiate and Cruciform, which are derived from the form of the corollas; Umbellate and Corymbiferous, from the inflorescence; Leguminous from the nature of the fruit.

Families resemble artificial orders in being composed of genera, but the principles on which the genera are brought together, differ widely in two cases.

Essential character—Natural.
Families of plants—Families resemble artificial orders, being composed of genera.

In the natural families, the classification is such as persons who have never studied botany, might make; thus, dill, fennel, caraway, &c. belong to the Umbellate family, on account of the form in which the little stalks, bearing the flower, and afterwards the seed, branch out from one common centre, like the sticks of an umbrella; this general resemblance is observed by all, and it seems very natural to class them together.

But in the artificial orders, genera which may be very unlike in other respects, are brought together, from the single circumstance of their having the same number of stamens and pistils. Thus, in the first order of the 8th class we have the tulip and the bulrush, the lily of the valley and the sweet flag.

In the second order of the 5th class we have the beet and the elm. You will at once perceive the striking disparity between these plants, and that an arrangement, which thus brings them together, is properly called an artificial method.

Many families of plants possess a marked resemblance in form and qualities, and appear evidently as distinct tribes. If the whole of the vegetable kingdom could thus be distributed into natural classes, the study of botany would be much simplified; but it has already been remarked that there are many plants which cannot be thus arranged, and no principle has yet been discovered for systematic arrangement which bears any comparison to the Artificial System. This system is compared to a dictionary; though by its use we do not at first find the word for which we seek, and then learn its definition, as we do in ordinary dictionaries; but we first learn some of the characters of a plant and then find the name. We are not however to rest after finding the botanical name; but having ascertained this, we can easily find to what natural family a plant belongs, and thus ascertain its habits, medicinal use, and other important particulars. The natural method may then be compared to the *grammar* of botany; between this and the artificial system the same relation exists as between the grammar and dictionary of a language; both are necessary to botanical science.

As the subject of classification is so important to a knowledge of Botanical science, we will now consider the general principles on which it depends.

Genera brought together by having the same number of stamens and pistils—Artificial system of arrangement compared to a dictionary—First learn the characters, then the name—The natural method considered as the grammar of botany—Characters used in classification.

RULES.

1st. *All botanical classification results from an examination and comparison of plants.*

2d. *Every organic distinction which establishes between individuals any resemblance, or any difference, is a character; that is, a sign, by which they may be known and distinguished.*

3d. *The presence of an organ, its different modification and its absence, are so many characters.*

4th. *The presence of an organ furnishes positive characters, its absence negative characters.*

Positive characters offering means of comparison, shew the resemblances and differences which exist between individuals; those plants in which these characters present but slight differences, should be collected in groups; those in which these characters differ more sensibly, should be separated; here we follow strictly the laws of the mind. But negative characters as they allow no comparison can only be employed to separate individuals, and never to bring them together.

When we say that plants have seeds with one or two cotyledons; that they have monopetalous or polypetalous flowers, and are provided with stamens and pistils, we point out particulars, where visible and striking resemblances may be observed; these *characters* then, are positive, since they are founded or something real.

When we say that some plants are destitute of cotyledon, corolla, stamens or pistils, we do not establish any real basis for the foundation of a comparison. If we wish to separate plants with monopetalous corollas, from such as have polypetalous corollas, this single *character* establishes at once, the *difference* which exists between the two groups, and the *resemblance*, which exists between the individuals of each group. Thus positive characters possess a great advantage over negative ones; the latter should never be employed when the former can be used; and in proportion, as positive characters can be substituted for negative, the science of botany will be perfected.

Positive characters can only be founded upon evident *facts*, and never upon a *presumption of the existence of facts*, derived from analogy. For it is contrary to true

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Found by examination and comparison of plants—Resemblances and differences are characters—Positive character—Negative character—Positive character used in grouping flowers—Negative characters in separating them—Advantage of positive characters over negative—Characters founded only upon positive facts.

philosophy, to suffer hypothetical reasoning to usurp the place of direct observation of facts.

5th. *Positive characters are constant or inconstant.* All seeds produced by plants of the same species have the same structure; all plants which grow from these seeds, produce other seeds, similar to those from which they have had their origin: of course the characters derived from the structure of these seeds are *constant.* But among these plants some are large and others small; some may have white corollas, some, red, or blue; some are more fragrant than others; of course, *size*, *color* and *odour* offer *inconstant* characters.

6th *All real science in botany must rest upon constant characters;* therefore, these characters are much more important than the others.

7th. *Constant characters may be isolated or coexistent.* The petals of the RANUNCULUS *acris* (butter-cup) have a nectary in the form of a scale; this character, although constant is *isolated*, for it is not necessarily connected with any other characteristic trait. The calyx of the *companula rotundifolia*, (blue-bell,) adheres to the germ; the germ must of necessity be simple or without divisions, and the corolla and stamens attached to the interior of the calyx. The character of the adherence of the calyx to the germ, brings in its train, several other characteristics; it is then *coexistent*; and is more important than the isolated character.

8th. *Two orders of characters are derived from the two great divisions of vegetable organs; those of vegetation and reproduction. The characters of vegetation are few, and mostly isolated; the characters of reproduction are numerous and often coexistent; one character often serving as an index to many others.*

It is seldom that plants which resemble each other in their characters of reproduction, differ much in their characters of vegetation. For example, all plants which have four *didynamous* stamens, attached to a monopetalous labiate corolla, and four seeds lying uncovered in a monophyllous calyx, have an angular stem and opposite leaves. On the contrary it frequently happens, that plants which resemble each other by the characters of vegetation, differ by those of fructification. Labiate and caryophyllous plants

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Positive characters constant or inconstant—Constant characters may be isolated or coexistent—These terms illustrated—Two orders derived from reproduction and vegetation—

agree in having their leaves opposite, and yet there is no resemblance in their flowers. This consideration alone, would seem sufficient for establishing the superior importance of the characters, of reproduction over those of vegetation. The seed unites in itself; the characters both of reproduction and vegetation. The embryo is the commencement of the new plant, and it offers us the first characters of vegetation; but its situation in the fruit, the number, form and consistence of its envelope are characters which belong to fructification.

As far as possible, in separating or bringing together plants, we should make use of prominent characters which the eye can see, without the help of the microscope; but if experience teaches us that the characters most constant and proper for the explanation of physiological phenomena can only be discovered by such aid, it is necessary to resort to this instrument, in order to establish the natural relations of plants.*

Having considered the meaning of *individual*, *species*, *genus and family*, and of the characteristics by which the three parts are grouped together, let us take a general view of this subject.

It is evident by the formation of species, genera and families, that every *species* should offer the essential characters of the family and genus to which it belongs; while the marks which distinguish this species from another species of its genus, will be such as do not belong to the whole genus or family. The *different genera* in families are also distinguished by characters which do not belong to the whole family; every individual, then will possess its *specific* character, its *generic character*, and its *family* character.

The specific character is less important than the generic, as it is mostly founded on the characters of the organs of vegetation, which we have seen are isolated and less important than the coexistent characters. We often find in the analysis of plants a great difficulty in determining their species, from the want of more definite marks of distinction.

Generic characters are mostly of the coexistent kind, and are more valuable than the specific characters. The distinctions of genera are usually much more apparent than those of species;

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* The rules and observations respecting characters for classification, are translated from Mirbels" *Elemens de Botanique.*"

Characters of reproduction more important than those of vegetation—Application of characteristics—General view of the subject—

as a rose can be more easily distinguished from a pink, than one species of rose from another species. Families are grouped together by marks of resemblance found in genera.

These family characters are of all the most important.

In the artificial classes and orders we depend on what we have before termed *factitious* characters.

In species genera and families, the essential characters, are also natural characters.

LECTURE XXII.

Natural Families.

In the view of natural families which we are now to give, we shall follow the divisions of both Jussieu and Linnæus, as they shall appear best adapted to answer the purpose of arrangement. The method of Jussieu being however, more philosophical than the natural method of Linnæus, we shall chiefly follow the classification of the former.

Class 1.

*Acotyledons.** *Embryo destitute of cotyledons, and a separate albumen.*

We find in this class, plants which are contained in the class Cryptogamia of the artificial system. *Fungi*, or mushrooms; these are either parasitical, or spring from the ground naked or enclosed in a *volva.* The substance of mushrooms is in some, like cork or leather, in others soft, fleshy and juicy. They are round or flat; some have a head called a *pileus* (signifying hat.) They have neither leaves or flowers. Instead of *anthers* they have a scattered, external or internal powder. Instead of pistils they have organs, which resemble thin plates, wrinkles, pores, tubes, &c. In these organs exists a substance analogous to seeds, which germinates and reproduces the species. The different species of fungi are known by the common names of toad-stool, puff-ball, &c.

The class without cotyledons contains several other families; of the remainder you are perhaps best acquainted with mosses and ferns.

* From *a* without, and cotyledon, signifying destitute of cotyledon.

Synopsis of Jussieu. Class first—Acotyledons—Embryo destitute of cotyledons and separate albumen—family, Fungi—Mushrooms.

Mosses have, instead of anthers, collections of tubes which evolve a substance analogous to pollen. The pistillate flowers are collections of many in one group; their germ, instead of a corolla, is covered with a membrane called a *calyptra*, (veil) whose summit admits the pollen. The fruit is a *capsule* opening by a lid, having a margin, either naked, or fringed with a certain number of teeth either in a single or double row. The seeds of mosses are very minute. The mosses are herbaceous, leafy and mostly branched; their roots are fibrous; some are annual, others perennial.

Ferns exhibit no other fructification than capsules which grow on the back or edges of leaves. The leaves are called fronds.

CLASS 2.

Monocotyledons. Stamens hypogenous, (below the germ,) Embryo with one cotyledon. The characters of this class are stamens inferior, calyx inferior when present; stamens seldom indefinite. Leaves mostly alternate and sheathing.

This class contains more than twenty families. *Aroides* constitute a family of which the genus *arum* (wild turnip) is an important member, and from which the name is derived; *oides*, being derived from the Greek, signifies like, or resemblance; thus *aroides* denotes plants resembling arum. This family have that kind of inflorescence called a *spadix* surrounded by that form of calyx called a *spatha*. Their leaves are sheathing, alternate, and radical.

Gramina, or *grasses* constitute an important family; they have generally three stamens and one germ. The embryo is small and attached to a farinaceous albumen. In germinating the cotyledon remains attached to the albumen and nourishes the plume. The roots are fibrous, and capillary. The culms are cylindrical and either hollow or pithy. The flower and calyx are scales, called glumes. The *chaffy flower*, *single seed*, *mealy albumen*, *situation of the embryo*, and *method of germination* distinguish in a peculiar manner, this family.

CLASS 3.

Monocotyledons. Stamens perigynous, (around the germ,) fruit with three cells; embryo small, with a large albumen.

Palms. In this class we find the family of the palms,

Mosses—Ferns. Class second—Monoctyledons—Characters of the class—Contains more than twenty families—Description of an important member. Grasses an important family. Class 3—Monocotyledons—stamens perigynous.

(*Palmæ,*) which have a corolla deeply parted into 6 segments, the 3 outer ones being the smallest. The stamens and pistils are on separate plants; the number of stamens is usually 6; the filaments are often united at their base. The germ is superior, or above the calyx. The fruit is a berry or fibrous drupe, the albumen of which is at first tender and eatable, and at last, becomes hard.

The stems of palms are usually undivided, lofty, and round: they are not composed of concentric circles, being endogenous, or growing internally; they are scaly from the remains of the indurated foot stalks of leaves; in treating of endogynous stems this peculiarity was observed. The leaves of palms appear in a terminal tuft, alternate and sheathing. Palms live to a great age; they are the product of tropical regions, and afford valuable food.

Liliaceous plants, (*Liliaceæ*) consist of six petals, spreading gradually from the base, and exhibiting a kind of bell-form appearance, but differing from the bell-form flowers in being polypetalous. The number of stamens in these plants is generally 6, sometimes but three; they are usually alternate with the petals.

The germ of the liliaceous plants is always of a triangular form, and contains 3 cells; the roots are mostly bulbous. The lily has a scaly bulb, the onion a tunicated or coated bulb, the tulip has a root which seems almost solid and tuberous.

The calyx is mostly wanting in the liliaceous plants, the stems are simple, without branches, the leaves entire, and nerved. To this family belong the tulip, lily, crown-imperial, dog-tooth-violet, &c Plants of this natural family usually belong to the artificial class Hexandria; the crocus, having three stamens, belongs to the the class Triandria.

Asparagi. We find in this class, which you will recollect contains plants with one cotyledon, and with stamens growing around the germ, a family called *asparagi*, from asparagus, one of its most important genera. The family *asparagi* is distinguished by monopetalous corollas, divided into 6 segments. The fruit is mostly pulpy and contains 3 cells. This family contains the genus CONVALLARIA (lily of the valley) *Trillium*, &c.

Narcissi. The family *Narcissi* contains the genus NARCISSUS *Amaryllis*, Hypoxis, Pontederia, &c. Their 6 stamens are inserted into the tube of the corolla. Their roots are mostly bulbous.

Irides. This family is so named from *Iris*, one of the most important genera. The leaves in this family are alternate, sheathing, and sword-shaped (*ensiform.*) The flowers are often attended by sheaths of two valves. We find here the *Ixia* and *Sysirinchium.*

Family of palms described--Liliaceous plants—Asparagi—Narcissi—Irides.

CLASS 4.

Monocotyledons, stamens epigynous, (above the germ.) ORCHIS PLANTS, (*Orchides.*) This family is distinguished by having for stamens only glutinous masses of pollen, sometimes sessile and sometimes supported by short filaments. The root has usually two knobs. In this family are the ORCHIS genus, from which it takes its name; the genus *Cypripedium* or lady's-slipper, which takes its name from its large nectary resembling a shoe; the *Cymbidium* or blue-eyed grass, &c.

CLASS 5.

Dicotyledons, without petals and with stamens epigynous, (above the germ.) The characters of this class are a calyx superior and of one leaf, and corolla wanting. It contains but one family *Aristolochiæ.*

CLASS 6.

Dicotyledons, without petals, stamens perigynous, (around the germ.)

We have in this class the family PROTEÆ, so named from Proteus, a fabulous deity who was remarkable for his transformations; these flowers being variable in their characteristics. We find in this class the family *Lauri* which contains the genus LAURUS. The family *Polygoneæ* is chiefly important as containing the genus Polygonum; the name of this genus is derived from the Greek *polus*, many, added to *gonu*, knot, signifying many knots, in allusion to its knotted stems.

CLASS 7.

Dicotyledons, without petals, stamens hypogenous, (beneath the germ.)

The most important characters of this class are a calyx inferior; scarcely any corolla, though some have scales resembling petals which bear the stamens and are alternate with them. In this class we find the family *Amaranthi*, deriving its name from the genus *amaranthus*, which has its flowers growing in a spike.

Class fourth—Monocotyledons, stamens epigynous—Orchides—Class fifth—Dicotyledons—Without petals, stamens perigynous—Proteæ—Lauri—Polygoneæ—Class 7th—Dicotyledons—Without petals, stamens hypogynous—Amaranthi.

CLASS 8.

Dicotyledons, corollas monopetalous, hypogenous, (below the germ.)

The calyx is monophyllous; corolla regular or irregular, bearing the stamens which generally alternate with its segments when of equal number: germ superior.

The *labiate* flowers, (*Labiatæ*) are found here; they are monopetalous, consisting of one piece; and are irregular in their outline and appearance. The term Labiate, derived from the Latin word *labia*, lips, has been given, on account of the flower appearing to be divided at the top into two parts, resembling the lips of a horse or other animal. This natural family is subdivided into *ringent* or *gaping*, where the entrance into the corolla is open, and *personate* or masked, where the corolla seems closed by a prominent throat or palate.

Botanists have made some confusion in the use of these terms. Linnæus called them all ringent, and then subdivided them into *labiate*, having lips, and *personate*, closed lips; most other botanists following him have made the same division. You can easily see, that to take for a general term, having a gaping mouth or lips, and then to separate this class into those which have lips, and those which have lips closed, is inconsistent. Thus instead of following a rule with regard to definitions, that as we proceed in more minute divisions, each branch is to contain all the qualities of the whole, or of the generic term, and some property or properties added to mark a specific difference; in this case, the species *labiate* has a more *general* signification than the *generic* term *ringent*.

We shall then consider Labiate as the general term, and divide this tribe of plants into *ringent*, those that have *lips gaping*, and *personate*, or such as have the *lips closed* or muffled.*

The labiate flowers have mostly four stamens of unequal length, standing in pairs, beneath an arch in the upper lip of the corolla. On account of this circumstance, they are ranked in the class Didynamia. A few of the labiate plants have but two stamens, and on that account, are placed in the class Diandria, as the sage and mountain mint (Monarda.) Here again the artificial system separates a tribe, which nature has made strikingly similar. If you examine a flower of this family, the balm or catmint, you will notice the arched upper lip of the petal

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* See Eaton's Botanical Grammar for the same distinction, also Thornton's Botany.

Class eighth—Dicotyledonous—Corollas monopetalous, hypogynous—Labiate flowers—Two divisions, ringent and personate.

covering the stamens, and that the lower lip hangs down so that you can see the inside of the corolla. If you pull out the corolla you will take the stamens along with it, the filaments being attached to it, as they usually are to monopetalous corollas. The corolla has a circular opening at the bottom, through which the pistil grew from the receptacle.

You have already been informed that the labiate flowers belong chiefly to the class Didynamia. The ringent division of plants belongs to the order Gymnospermia, having four seeds, lying naked in the calyx. The personate division belongs to the order Angiospermia, having the seeds enclosed in a capsule until they are ripe, when the capsule opens spontaneously, and disperses them.

The ringent flowers generally grow in whorls or circles and at the upper part of an angular stem, the leaves standing opposite. These plants are never poisonous. Among them we find many aromatic plants, the peppermint, lavender, savory, marjorum, thyme, &c; also many herbs which are useful in sickness, as pennyroyal, catmint, horehound, &c; the scullcap (Scutellaria,) which has been said to be a remedy for the hydrophobia, the modest *ianthus*, (blue gentian,) and a little flower of a most beautiful blue colour called *Trichostema*, or blue curls.

The personate division affords some very splendid flowers, as the painted cup, (Bartsia,) the beautiful Gerardia, American foxglove, and the magnificent bignonia, (Trumpet flower.) The plants of this family seem to be somewhat allied to those of the class Pentandria; in many of these, as in the snapdragon, (Antirrhinum,) the Penstemon, &c., there exist the rudiments of a fifth stamen, in accordance with the five divisions of the calyx and corolla. Some plants of this division of the Labiate family are poisonous, as the foxglove and snapdragon.

Class 9.

Dicotyledons. Corolla monopetalous perigynous (around the genera.) The calyx is of one leaf and supports the corolla. In this class we treat with the family *Companulaceæ;* its principal genus is CAMPANULA, a term derived from the Latin signifying a little bell. The *bell-form* corollas have mostly a calyx above the germ; regular corolla, inserted into the top of the calyx; stamens 5, inserted into the same part under the corolla, alternating with its divisions; style; capsule usually 3 celled, bursting laterally.

Plants with ringent flowers never poisonous—Those with personate flowers sometimes poisonous. Class ninth—Corolla monopetalous, perigynous—Campanulaceæ.

CLASS 10.

Dicotyledons *Corolla monopetalous epigynous*, (above the germ.) *Anthers united.*

This class contains several families which may all be included under the general term *compound flowers*.

The flowers of this family begin to blossom in the latter part of summer, and are found almost bordering upon the verge of winter. The dandelion is among the earliest flowers of spring, and one of the latest of autumn. The daisy is found in almost every spot which exhibits any marks of fertility.

The dandelion is not a single flower like a violet or rose, but a crowded cluster of little flowers. The sun-flower is so large and conspicuous as doubtless to have frequently attracted your notice. If you would examine one carefully you would find it to be composed of more than a hundred florets or little flowers, each as perfect in its kind as a lily, having its corolla, stamens, pistil and seed.

We distinguish the Sun-flower into two parts,—the *disk*, which is the middle of the flower, and supposed to have resemblance to the middle or body of the sun; the *ray* is the border of the flower, or those florets which spread out from the disk as rays of light diverge from the sun. The florets in this, as in other compound flowers, do not all begin to expand at the same time, they usually begin at the disk and proceed inwards towards the centre.

If you examine with a microscope one of the florets of the disk, you will perceive it to be tubular, containing one pistil surrounded by five stamens, which are separate, but the five anthers grow together, forming a tube around the pistil.

It is this union of anthers which gives to this kind of compound flowers a place in the class Syngenesia, which name signifies anthers growing together. The florets of the ray are called neutral, having neither stamens nor pistils: the circumstance of neutral florets in the ray places the sun-flower in the order *Frustranea* of the 17th class.

Although the term compound is confined to the flowers of the class Syngenesia, the real circumstance on which the class is founded is not the compound character of the flower, but the union of the anthers. A Clover blossom may be said to be compound, because it is a collection of many little flowers compounded or united into one; but each little floret of the clover has its own calyx; there is no general calyx enclosing the whole, as in most of the Syngenesious plants, but the florets are arranged in

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Class tenth—Dicotyledons—Includes compound flowers—Dandelion—Daisy—Sunflower—Clover.

such a manner as to form a head; the anthers are separate, the filaments are connected at their sides, and this latter circumstance, together with the papilionaceous form of the corolla, places the clover in the class Diadelphia.

Most of the Syngenesious flowers are composed of two sorts of florets, either *tubular* with a toothed margin, or *strap* shaped, appearing flat like a strap, but being also toothed at the edge; these are sometimes called Semi-florets, or half flowers.

Three sections are made upon the consideration of these different florets.

1st. *Semi-flosculous* flowers, which are entirely composed of the strap shaped or *ligulate* florets, the dandelion and lettuce are examples of this section; these are all of one colour.

2d. *Flosculous* flowers, such as are entirely composed of the tubular florets, as the thistle and saffron; these are also of one colour.

3d Section comprises those flowers which are composed of both *tubular* and *strap shaped florets*, the disk or middle consisting of tubular florets, and the ray or border of the flat florets. The colour of the disk and ray is often different in the common Daisy; the disk is yellow, the rays are white.

As the Syngenesious flowers are more difficult to analyze than any others except the Cryptogamous plants, we will assist you with a drawing of one of these plants.

ANALYSIS OF THE DAISY.

We have here a representation of the mountain daisy; as we have the whole plant before us, we will in regular order consider the appearance of all its different parts.

1. The *Root:* you will observe this answers to the general description of *fibrous*, having the small thread-like parts issue from the main root, or *radix:* from these fibres sometimes spring out little tubercles, so that it may be said to be *fibrous tubercled.*
2. The *Leaves* you observe, spring from the root, and are hence called *radical;* being also undivided, they are therefore *simple.* In form they are somewhat oval, with the narrow end towards the stem; this form is called *obovate.* The leaves are said to be *crenate*, on account of the notches upon their margin.
3. The *Stem* is called a *scape*, because it springs directly from the root, and bears no leaves; it is said to be naked, having no kind of appendages.

Three sections of compound flowers.—

4. The *Calyx* is said to *hemispherical*, or like a half sphere; it is *common*, that is enclosing many florets; the leafets of the calyx, sometimes called scales, are equal, or of the same size.
5. The *Corolla* is *compound*, having many florets on one receptacle, *radiate*, having rays; the florets of the disk *tubular*, and have both stamens and pistils, funnel shaped and five toothed; the florets of the ray are flat, and have only pistils.
6. The *Stamens are five*, *united* at the summits by their anthers forming a tube.
7. The *pistil*, in the disk florets, passes up through the tube formed by the anthers; the stigma is parted into two divisions, which are *reflexed*, (bent back;) the pistil on the ray florets passes up through the tube of the floret, but is unaccompanied by any stamens.
8. The plant has no *pericarp*, or seed vessel, the seeds are single and shaped somewhat like an egg; they are also naked, that is, destitute of the downy plume called egret, which is seen upon the dandelion, and many other of the syngenesious plants.
9. The *receptacle* is *conical*, or in shape resembles a sugar loaf, it is dotted with little holes: these are the places in which the seeds were fixed; the appearance of the receptacle, whether naked or chaffy, is very important to be observed in the syngenesious plants, it sometimes constitutes a distinction between genera.

The botanical name of the daisy is BELLIS *perennis*. It belongs to the class 17th, Syngenesia, because the anthers are united; order 2d, Superflua, because the pistils in the ray are superfluous having no stamens.

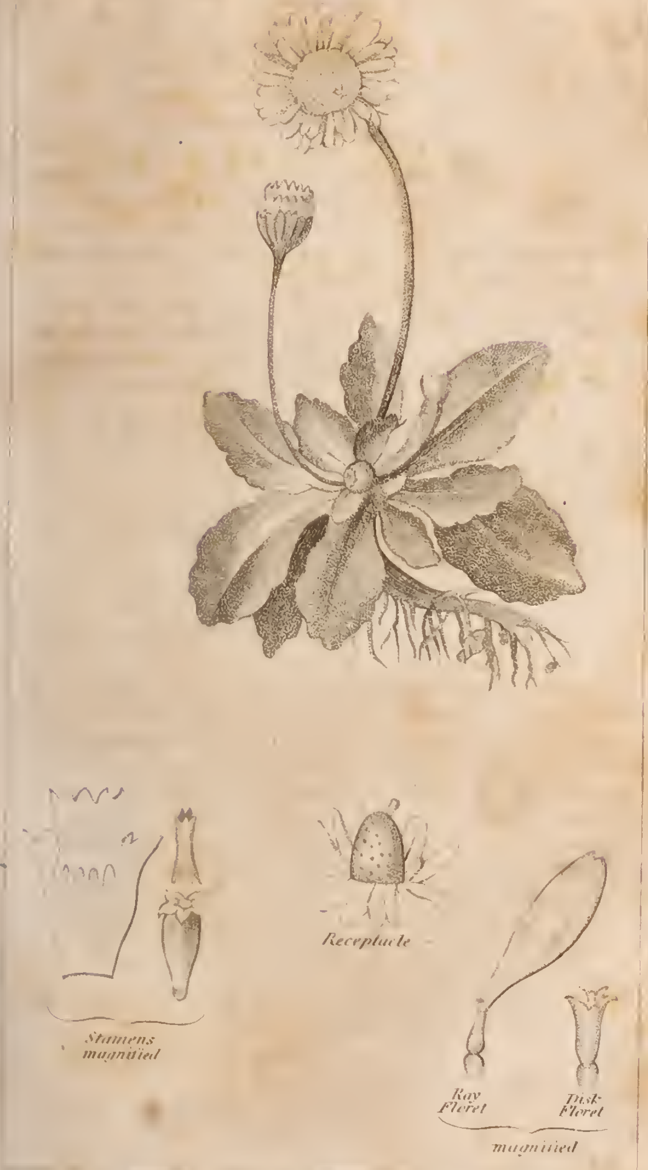
The generic name *Bellis*, is from an ancient Latin word, *belles*, handsome; from which comes also the French word bel; the specific name, *perennis*, signifies that it is a perennial plant, or one whose roots live several years. The English name daisy is derived from a property, which many of the syngenesious plants possess, of folding up its petals at the setting of the sun, and expanding them with its rising. The poet Chaucer, who lived in the fourteenth century, is said to have first noticed this circumstance, and to have called the flower Day's-eye. The French name for the daisy is *La belle Margarite.*

Many of the flowers we have now described under the head of *compound flowers*, are by Jussieu placed in a family called *Corymbiferæ*, from their mode of inflorescence, which, in the compound flowers, is mostly, that of a *corymb.*

Analysis of the daisy.

MOUNTAIN DAISY

PLATE XI.



Miss Lee del

Illman & Pilbrow

BELLIS PERENNIS
Class XVIII. Order II.

CLASS 11.

Dicotyledons. Corolla monopetalous, epigynous (above the germ.) *Anthers distinct.*

The most important family in this class is the *Rubiaceæ* which contains the genus Galium, and some other important genera, not distinguished by striking peculiarities of natural character.

CLASS 12.

Dicotyledons. Corolla polypetalous, stamens epigynous, (above the germ.)

This class presents us with one important family, the *Umbellate* (*Umbelliferæ.*)

The plants of this natural family are found in the artificial class Pentandria; they derive their name from the Latin word *umbella*, an umbrella, on account of the manner in which the peduncles of flower stalks grow out from the main stem.

The umbellate plants are mostly herbaceous, those which grow on dry ground are aromatic, as dill, fennel, and caraway; those which grow in wet places, or the aquatic species, are among the most deadly poisons, as water-hemlock, &c. Plants of this family are not in general so beautiful to the sight, nor so interesting as objects of botanical analysis, as many others.*

The corolla is superior, or over the germ, consisting of five petals, usually with a stamen standing between each petal. From the centre of the flower arise two styles which often remain permanent upon the fruit. The general figure of the fruit is oblong or oval; it separates perpendicularly into two seeds, as may be seen in the fennel or dill. The figure, margin, and angles of the seeds are considered as affording proper characters for the distinction of genera, as in the parsnip, they are flat, in the carrot, bristly, in the hemlock, marked with ridges. Among the plants of this family which are used as articles of

"*Botanists in general shrink from the study of the Umbelliferæ; nor have these plants much beauty in the eyes of amateurs; but they will repay the trouble of a careful observation. The late M. Cusson of Montpellier bestowed more pains upon them than any other botanist has ever done; but the world has, as yet been favoured with only a part of his remarks. His labours met with a most ungrateful check, in the unkindness, and still more mortifying stupidity of his wife, who, in his absence from home, is recorded to have destroyed his whole herbarium, scraping off the dried specimens for the sake of the paper on which they were pasted !"—*Sir James Edward Smith's Botany.*

Class 11th. Dicotyledons—Corolla monopetalous, epigynous—Rubiaceæ—Class 12th—Dicotyledons—Corolla polypetalous—Stamens eyigynous—Umbelliferae—Umbellate plants in dry soils, aromatic; in wet, poisonous.

food, are the carrot, parsnip, celery, and parsely; the aromatics are dill, fennel, sweet cicely, caraway, and coriander; and among the poisonous plants, are the conium, (poison hemlock,) water-parsnip, and the cicuta, (water-hemlock.)

CLASS 13.

Dicotyledons. Corolla polypetalous, stamens hypogenous, (under the germ.)

In this class the principal family is the Cruciform (*Cruciferæ.*) In these plants we find such flowers as have a calyx consisting of four leaves, and a corolla composed of four petals; each petal is fastened to the receptacle or bottom of the calyx by a narrow part called a claw; the whole exhibiting the form of a cross; hence the term cruciform, from *crux*, a cross. In the centre of the flower is a single pistil, long and cylindrical; the stigma is oblong and divided into two parts, which are reflexed or bent back on each side. Each petal is placed between two leaves of the calyx; this alternate position is always seen in flowers where the number of petals equals the number of leaves of the calyx.

The cruciform flowers have six stamens, two of which standing opposite to each other are shorter than the remaining four, which always stand in pairs. This inequality in their length determines them to be in the class Tetradynamia. The germ soon becomes a long pod called a silique, or a short thick one, called silicula; this difference in the length of the two pods constitutes the distinction of the two orders of the class in which they are placed.

The plants belonging to this class are herbaceous, the leaves alternate, the cabbage, the mustard, the radish, and stock-gilly-flower belong to this family. They are found on a chemical analysis to contain some sulphur.

CLASS 14.

Dicotyledons. Corolla polypetalous, stamens perigynous, (around the germ.)

In this class we find the family *rosaceæ*, having rosaceous corollas, a calyx mostly urn-form; petals usually 5, inserted into the top of the calyx; stamens indefinite, generally over 10. The structure of the fruit varies in some; as in the apple, (Po-

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Class 13th—Dicotyledons—Corolla polypetalous—Stamens hypogynous—Cruciferæ—Description of the family Cruciferæ—Class 14th—Dicotyledons—Corolla polypetalous—Stamens perigynous—Rosaceæ.

mum) the fruit is below the top of the calyx and contains many cells; embryo without albumen.

This family comprises the rose, (ROSA) apple, and peach. (AMYGDALUS.)

In this class is found a very large and important family, called *Leguminosæ* (leguminous) from the nature of the fruit, which is of that kind called a legume; the flowers of this family are also called *papilionaceous*, from a Latin word *papilio*, a butterfly, on account of the supposed resemblance between them and that insect; they are generally flowers with brilliant colouring and of showy appearance. The sweet pea may be given as an example; this unites to delicacy of colour and beauty of form, a highly fragrant perfume.

The flowers belonging to this natural family are so peculiar in appearance as to make them easily recognized. The rose, the pink, and the bell-flower, are regular in their form; that is, there is a symmetry and equality in their parts. In a regular corolla, if we suppose the point of a compass placed upon its centre, and a circle traced around the edge of the flower, each one of its divisions will just touch the circle. There may, however, be slight inequalities in regular corollas, as in the lily we sometimes see some petals a little longer than the others; this is an exception to the general rule.

You must learn to distinguish between rules and exceptions; it is often owing to a want of this discrimination, that, young persons find difficulties in understanding a science; they confound the rules and exceptions, thinking very erroneously, that the knowledge of the one, is as important as that of the other. If a clear conception of general rules be established in the mind, the exceptions or variations will be gradually learned as you apply the rules to particular cases. But if you attempt at the commencement of the study of any science, to learn all the exceptions as well as rules, you will never obtain clear ideas upon the subject.

You will recollect the general rules with respect to regular corollas. Irregular corollas differ so widely from these general rules, that you will be in little danger of mistaking them for exceptions; they constitute, indeed, a different natural family, though according to the artificial method of classification, they may often be placed near to regular corollas. Irregular corollas are various in their forms; the papilionaceous, which we are now considering, seem, as they stand upon their stem, to consist of an upper and under part. In examining a flower of

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Leguminosae, an important family—Its flowers called papilionaceous—Regular corollas—Irregular. Important to distinguish between rules and exceptions—

this kind, a pea for example, you should first observe the calyx; this is monophyllous, that is consisting of one entire leaf, ending in five distinct leafy points: the two upper ones wider than the three under ones. The calyx bends towards the lower part, as also does the peduncle, or little stalk which supports it. The peduncle is very small and flexible; so that the flower readily avoids a current of air, and turns its back to the wind and rain.

In examining the corolla you will see that it is *polypetalous.* The first piece is a large petal covering the others, and occupying the upper part of the corolla; it is called the *standard or banner.* This petal is evidently designed, to protect the stamens and other parts of the flower, from the injuries of the weather. Upon taking off the banner you will find that it is inserted by a little process, or projecting part into the side pieces, so that it cannot be easily separated by winds. The banner being taken off, the two side pieces to which it adhered are exposed to view; these are called the *wings;* they are strongly inserted into the remaning part of the corolla, and their use appears to be, that of protecting the sides of the flower. Upon taking off the wings, you will discover the last piece of the corolla, called on account of its form, the *keel* or boat. This covers and protects the stamens and pistils. Upon drawing the keel downwards, you will find ten stamens, and double the number of petals; these stamens, are joined together by the sides of their filaments, appearing like a cylinder surrounding the pistil. One of the stamens, however, does not adhere to the rest; but as the flower fades and the fruit increases, separates and leaves an opening at the upper side, through which the germ can extend itself by gradually opening the cylinder. In the early stage of the flower, this stamen will seem not to be separated; but by carefully moving it with a pin or needle, its filament will be found unconnected with the other nine.

Most of the papilionaceous plants belong to the class Diadelphia, order Decandria. The name of the class *Dis*, two, and *Adelphia*, brotherhood, signifies that the stamens are in two sets or brotherhoods; that is, nine in one set and one in the other. The name Decandria signifies ten stamens.

But if the flower, although papilionaceous, should have ten stamens, all in one set, it is then placed in the class Decandria.

According to this arrangement, a very striking natural family of plants is widely separated, a part being taken from the 14th class and carried to the 10th.

The germ of the papilionaceous plant extends itself into that

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Parts of palilionaceous flower—Banner—Wings—Keel.

kind of pod called a *legume*. It is distinguished from the Silique of the cruciform family, by there being no partition in the legume. Besides, the seeds grow to one side only, being alternately attached to the edges of the two valves ; but in the silique pod they are alternately attached to both edges of the partition.

The legume also opens lengthwise and rolls backwards; in the silique, the valves separate and stand out from the base upwards. The seeds of this family as you have been already informed, have a marked scar, black spot, or line, called the *hilum*, by which they adhere to the pod. Near this scar there is a minute opening into the body of the seed, through which moisture is imbibed at the period of its first growth or germination. The proper germ, or that part of the seed which is to be the future plant, continues to swell and at length bursts through the coats of the seed, presenting between the divided halves the first true leaves, and the root, which commences its journey downwards. These divided halves of the seed are the cotyledons or seed leaves, they furnish support to the infant plant until it is sufficiently mature to seek its own support, and then they gradually decay.

The term Leguminous, which is taken from the fruit, as Papilionaceous is from the flower, is applied to the family of plants we are considering. In this family we find the fine table vegetables, beans and peas, the useful medicinal plant, the liquorice, the fine colouring indigo, the fragrant clover, so grateful as food to many of the domestic animals, the splendid locust tree, the elegant lupine, and the delicate and odoriferous sweet pea.

CLASS 15.

Dicotyledons, without petals ; stamens separated, that is, in a different flower from the pistils.

Having followed Jussieu in his leading principles of arrangement, we have now arrived at that class of plants which we term imperfect, as the stamens and pistils are no longer united in the same flower. These are the plants which Linnæus calls Cryptogamous. We here find a large family called *Cucurbitaceæ*, from *curvus* curved ; this contains the genera of the squash, gourd, cucumber, &c. which have Monœcious, and sometimes Diœcious flowers.

The *Amentaceae*, are also found in the 15th class. This family has its staminate flowers arranged with scales, in that form of

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Distinction between legume and silique—Class 15th—Dicotyledons—Without petals—Stamens and pistils in separate flowers—Hence called imperfect—Cucurbitaceæ—Amentaceæ.

inflorescence, called *an ament.* The stems of these plants are woody and generally of great height, as the oak and chesnut.

The *Coniferæ*, have their pistillate flowers mostly arranged in a *cone*, (*strobilus*,) formed of scales each of which performs the office of a calyx. The pine and cypress belong to this family.

LECTURE XXIII.

Use of Botanical Names—Artificial classes and orders considered in groups.—Classes 1st. *and* 2nd.

Having briefly noticed some of the most conspicuous families of plants according to the arrangement of Jussieu, we will now proceed to consider the *Artificial* or *Linnæan system.*

You already know something of the principles, on which this is founded; but, in the condensed form under which it has hitherto been presented, you cannot understand as well as by taking it up more in detail. We shall now examine each class separately, with the orders it contains, and the most remarkable plants and natural families, which we shall meet in our progress through this system.

From what has been already observed, you have no doubt come to the conclusion, that this is the best method yet discovered of finding out new plants, and of ascertaining the botanical names of those which are already known by their common names. If in all countries the common names were alike, there would be no need of any other; but the names of plants vary in different languages as much as other terms. We call that *pen* which in France is called *plume*, so we call that *oak*, which is there called *chene.*[*] Even in the same countries, and often in the same neighborhoods, the common names of plants are different, but botanical names are the same, in all ages and countries; without this uniformity no permanent improvement could be made in the science. A Botanist in France who should send a description of *la chéne*, (the common name for oak,) to his friend in America, would not be understood; if the American knew something of French, he might mistake the word for one which is like it, *chien*, which signifies a *dog*, and thus he might fall into the grotesque mistake of supposing that in France they had a wonderful species of *dogs*. But let the French Botanist use the term *Quercus*, and on the supposition that his American friend understood Botany, he would at once know the meaning of the term as plainly as if it had been written oak. All botanical names are in Latin, because this is the language most universally studied; and for this reason all books on botany were for a long time written in that language.† And although it is well for the learned, thus to communicate with each other, by one common language, it would be unjust to deprive, of the pleasure and improvement to be derived from this science, all who are not versed in that language. But the learned are not only in general intent upon making discoveries, they also derive a pleasure in imparting them to others; and the fountains of botanical knowledge have, by the exertions of men of genius and learning, been made accessible to all.

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[*] Pronounced shane.

Coniferæ.
Use of Botanic names.

The Classes in the artificial system are 21.

GROUPS OF CLASSES.

1st. *The first ten classes* are founded upon the *number* of stamens.

2d. *Eleventh* and *Twelfth*, upon the *number* and *insertion* of stamens.

3d. *Thirteenth* and *Fourteenth*, upon *number* and *length* of stamens.

4th. *Fifteenth*, *Sixteenth*, *Seventeenth* and *Eighteenth*, upon *connexion* of stamens.

5th. *Nineteenth* and *Twentieth*, upon *position* of stamens.

The *Twenty-first* class includes all plants which either have not stamens and pistils, or in which these organs are too minute to be seen, without the help of a microscope.

The orders are founded,

1st. Upon the number of Pistils.
2d. Upon the seeds being covered, or lying uncovered in the calyx.
3d. The relative length of the pods.
4th. The comparison between the disk and ray florets of compound flowers.
5th. Number of Stamens.
6th The orders of the class Cryptogamia are distinguished by natural family characters.

NAMES OF THE ARTIFICIAL CLASSES.

1. MONANDRIA, one stamen.
2. DIANDRIA, two stamens.
3. TRIANDRIA, three stamens.
4. TETRANDRIA, four stamens.
5. PENTANDRIA, five stamens.
6. HEXANDRIA, six stamens.
7. HEPTANDRIA, seven stamens.
8. OCTANDRIA, eight stamens.

† All the botanical works of Linnæus were written in Latin.

Artificial classes considered in groups—Linnæan system—Classes examined separately—Circumstances on which the orders are founded—Artificial system.

9. Enneandria, nine stamens.
10. Decandria, ten stamens.
11. Icosandria, over ten stamens, situated on the calyx.
12. Polyandria, over ten stamens situated on the calyx.
13. Didynamia, four stamens, two long, and two short, flowers labiate.
14. Tetradynamia, six stamens, four long and two short, flowers cruciform.
15. Monadelphia, stamens united by their filaments into one set.
16. Diadelphia, stamens united by their filaments into two sets, flowers papilionaceous.
17. Syngenesia, five stamens united by their anthers, flowers compound.
18. Gynandria, stamens growing on the pistil.
19. Monœcia, stamens and pistils on different flowers of the same plant.
20. Diœcia, stamens and pistils on different flowers of different plants.
21. Cryptogamia, stamens and pistils invisible.

CLASS MONANDRIA.—*Containing two orders.*

ORDER MONOGYNIA.

In this country we have very few examples of plants of this class: the Hippuris an aquatic plant is sometimes found in stagnant water; it is the most simple of all perfect* flowers, having neither calyx nor corolla, and but 1 stamen, 1 pistil, and 1 seed. The germ in maturing, hardens into a naked seed without any kind of appendages. The genus Hippuris contains but one species. It belongs to the natural order Inundatæ, signifying growing in water.

The Salicornia or Samphire is found in salt marshes near the sea coast; it grows also at the Onondaga salt-springs.† In Europe it is collected in large quantities, dried in the sun and then burnt; the ashes are collected and used in the manufacture of soda.

Shakspeare speaks of this plant in describing the precipice of Dover, which overhangs the sea.

> "How fearful,
> And dizzy 'tis to cast one's eyes so low!
> Half way down,
> Hangs one that gathers Samphire: dreadful trade!"

Although the plants of this class are so very limited in northern countries, some of the most valuable vegetable productions of the tropical regions are found here; as the Arrow root so useful to the sick as a nutritious substance; the Turmeric re-

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* Although so destitute of other organs, it is called perfect because it has stamens and pistils.

† See Eaton's Manual.

Class Monandria—Order Monogynia—Hippunis — Salicornia—Tropical plants belong to this class.

markable for the peculiar yellow color of its bark; here also is found the Ginger, which grows wild in some parts of Asia, and is cultivated in the East and West Indies. The flowers of the Ginger are beautiful and fragrant; the root only is used in commerce. The Ginger (*Ammomum*,) belongs to the natural order *Scitamineæ*, which embraces several genera of aromatic plants. The distinguishing marks of this natural family are an herbaceous stem, very broad leaves, a germ with three corners, and a liliaceous corolla.

The red valerian (VALERIANA *rubra*), has but one stamen, and might seem properly placed in this class, but other species of this plant having three stamens, this one goes with the majority into the class Triandria. It is however not common for different species of one genus to differ in their number of stamens.

ORDER DIGYNIA.

Contains an american plant, ELITUM, which is destitute of a corolla.

DIANDRIA.—*Containing three Orders.*

ORDER MONOCYNIA.

This, though more extensive than the class Monandria, is somewhat limited. We can however, without difficulty, find examples for its illustration. The Lilac, (Syringa,) is cultivated in all parts of our country, and is exceeded in beauty by few ornamental shrubs, in fragrance perhaps by none.

The Corolla is *salver* form, or with a tube which spreads out into a flat, four-parted border. You might, at first view, suppose the corolla to consist of several petals, but if you attempt to pull them out they will all come off together, and you will plainly perceive there is but one piece, or that it is monopetalous. In flowers of one petal, the stamens are generally fastened to the corolla; where there are several petals, the stamens are mostly attached to the receptacle; this affords a good mark of distinction between the two kinds of corollas.

You will perceive in the lilac, the two stamens standing opposite to each other, and fastened to the corolla. The form in which the blossoms are crowded together, forming a large bunch is termed a *thyrse*, which differs from a panicle, only in having the spikes which compose it more densely crowded.

The lilac, although so common with us, is an exotic; the species most cultivated are the *vulgaris*, or common, which has

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Order Digynia—Diandria—Lilac.

heart-shaped leaves; and the *persica*, or Persian, with narrow leaves.

The Jasmine, of which twenty-eight species are said to have been discovered, is an exotic of this class. The prim, (*Ligustrum*,) is found growing wild in some parts of New England; though in general it is seen but little in the United States, except when cultivated. In England, it is planted for fences; as it grows rapidly, it soon becomes useful for this purpose, and with its green leaves and white flowers, it also gives to the farms an air of neatness and taste.

The Sage, (*Salvia*,) on account of the form of its corolla belongs to the natural family of the labiate flowers; these are mostly placed in the class Didynamia, having four stamens, two long and two short: but in some cases the labiate flowers have but two stamens; this circumstance, according to the rules of classification, separates them from their natural family, and brings them under the class we are now considering. You may understand this better, if we compare it to taking a person from his relations, to put him among strangers. But this evil must sometimes be borne for the sake of some attendant good; we are also obliged to submit to the necessity of occasionally separating the flowers from their natural relations, because we cannot turn aside from our rules of classification to accommodate a few plants, which unfortunately possess those properties which bring them under two sets of laws. The sage seems to have made an effort to escape this misfortune, for it seems almost to have attained four, by doubling its filaments, but two of these having no anthers cannot be considered as stamens; therefore the plant falls back into the second class, and is placed by the side of the lilac, to which it has no kind of resemblance, except in its two stamens. This plant, however, is not the only one of the labiate flowers, which is removed from its natural family in the 13th class; for the rosemary and the mountain mint, accompany it into the second class; but these have not the two imperfect filaments which were remarked in the Sage.

The genus Salvia contains one hundred and fourteen species; the one most commonly cultivated with us is the *officinalis*, a shrub-like perennial plant; to this we give more particularly the name of sage. Another species of the same genus is the *sclary*, called Clarry, this has larger and broader leaves than the common sage; it is cultivated for its medicinal properties.

A very small plant called Enchanter's Night-shade, (*Circæa*,) may be found growing wild in shady places; it is a very harm-

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Sage—Enchanter's night shade.

less, modest looking plant, notwithstanding its ominous name. It has a small white blossom, in the parts of which, great uniformity as to number may be observed; having two *stamens*, a corolla with two *petals*, a calyx with two *leaves*, capsule with two *cells*, each of which contains two *seeds*.

The symmetry of structure, observable in the plant just described, is seen in many flowers; as those of two stamens often have the number two prevail in the other parts of the flower; this number is frequently doubled, as in the Lilac, which has two stamens, and the corolla four parted. In a plant with three stamens, the number three or six usually prevails in the divisions of the calyx, corolla, capsule, &c. A knowledge of this fact will assist you in determining the class of a plant; for example, if you have a flower whose calyx has five or ten divisions, and the corolla the same number, you may expect, if the flower is a perfect one, to find either five, or ten stamens; or if the divisions of the flower be two, there will generally be two, or four stamens; if three, either three, or six stamens; if four, either four or eight stamens. The number five, as divisions of the calyx, corolla and capsule, is generally united to five or ten stamens, and found in the 5th and 10th classes.

Another native plant of the second class, is the *Veronica*. Of the seventy species which this genus is said to contain, no more than six or eight are common to North America. The Veronica and the Circæa both turn black when dried; although they do not add to the beauty of an herbarium, they are desirable in a collection of plants, as our country contains few specimens to illustrate the second class.

Among the exotics of this order we find a singular plant peculiar to the East Indies, the NYCTANTHES *arbor tristis*, or sorrowful tree; it drops its boughs during the day, but through the night they are erect and appear fresh and flourishing.

The Olive (*Olea*) is common on the rocks of Palestine, and may now according to the accounts of travellers be found upon the same spot which was called, eleven centuries before the Christian era, the mount of Olives, or mount Olivet.

ORDER DIGYNIA.

In the second order of this class is the Sweet vernal grass. (ANTHOXANTHUM *odoratum*,) which is found in blossom in May; this is the kind of grass which is used in this country as a substitute for the Leghorn grass, in the manufacture of hats. The first hat of the kind was made a few years since by an ingen-

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Arbor tristis—Olea.

ious female in the town of Wethersfield, Connnecticut; since which time, many hats, not inferior to the best Leghorn, have been made from the same material.

The Catalpa, an elegant tree with flat, *cordate*, or heart-shaped leaves, is indigenous to the Southern United States; its white flowers, striped with purple, grow in panicles similar to the Horse-chesnut. Only one species is found in North America.

ORDER TRIGYNIA,

Contains the genus *Piper*. one species of which, the *nigrum* is the common black pepper. The cayenne pepper belongs to the eighth class, to the genus CAPSICUM. The Piper genus has neither calyx or corolla.

We have in the course of this lecture remarked upon the use of botanical terms, with the necessity of their being in one common language; we have considered the few groups into which the classes of Linnæus may be arranged with the names of all the classes, and the characters of each; and lastly, have given a sketch of the two first classes, with some examples under each of their orders. In doing this, we have been obliged to pass by many plants which might have had an equal claim to notice, but as knowledge must be gained by the observation of particular cases, we have thus selected some, in order that you may be prepared to examine the others, with pleasure and advantage.

LECTURE XXIV.

CLASS III—TRIANDRIA, AND CLASS IV—TETRANDRIA.

TRIANDRIA.

MONOGYNIA.

In the 1st order of this class we find among our common exotics, the Crocus, which is particularly interesting as being one of the earliest flowers of our gardens, not unfrequently blossoming in the neighbourhood of a snow bank. It has a bulbous root, long and narrow leaves, a spatha kind of calyx, and six petals. Besides the CROCUS *vernus* or spring crocus, which often appears

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Catalpa—Recapitulation—Order Trigynia—Class third, Triandria—Class fourth Tetrandria—Monogynia—Crocus.

even in our own climate as early as March; there is, of this genus a very distinct species, the CROCUS *officinalis*, or the true saffron, which appears among the late flowers of autumn. The following beautiful lines, respecting these flowers, are from the pen of the interesting Henry Kirke White, whose untimely death, in the spring time of his existence, has been deeply regretted, but his early and fervent piety, marked him as a fit inhabitant for a purer sphere; a christian, and philosopher, he could see an invisible hand directing the operations of nature.

> "Say, what *impels* amid surrounding snow
> Congealed, the *Crocus' flamy bud* to grow?
> Say what *retards*, amid the Summer's blaze,
> The *autumnal bulb*, till pale declining days?
> The GOD OF SEASONS, whose pervading power
> Controls the Sun, or sheds the fleecy shower:
> He bids each flower his quickening word obey;
> Or to each lingering bloom, enjoins delay."

The Iris, or Fleur-de-lis, (pronounced by a corruption of the French, *Flower de luce*,) is the national flower of France, as the Rose is of England. You will find on attentive examination that this is a very curious flower. It has no proper calyx, but a spatha; its corolla consists of six parts, alternately *reflected*, or bent back; the pistil has three stigmas, which appear at first view like petals. The Iris is so named from Iris, the rainbow, on account of the various colours which it reflects, varying from different shades of purple, into blue, orange, yellow, and white. We have several native species of Iris, one of which, the common Blue flag, is found in wet places. The flowers are purple streaked with with yellow; this is sometimes called Poison flag. The Crocus and Iris are found in the natural family of Jussieu called *Iridea;* this family is in the class of monocotyledons, having stamens around the germ, or *perigynous*. Linnæus calls the same plants, *Ensatæ* from the Latin word *ensis*, a sword, on account of the shape of their leaves, being long, narrow and pointed.

ORDER DIGYNIA.—*The Grasses.*

The 2d *Order* of the third class contains the natural family of the grasses, (*Gramina*); they are distinguished by a strait hollow, and jointed stem, or *culm*; the long and linear leaves are placed at each joint of the stalk in alternate order, enclosing it like a sheath. The *flowers* of the grasses are found in what is called the ear, or head, and consist of two green husks, called a *glume;* within this glume calyx is the blossom, consisting of a

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Iris—Order Digynia—Grasses—Flowers of the grasses.

husk of two valves. These husks constitute the *chaff*, which is separated from the seed by an operation called threshing.

These little flowers, which are also furnished with a nectary, are green, like the rest of the plant, and you will need a microscope to view them accurately; they are best observed in a mature stage of the plant, when their husks, expanded, discover their three filaments, containing each a large double anther; their two pistils have a kind of reflected, feathered stigma. They have no seed vessel; each seed is contained within the husks, which gradually open; and unless the seed is gathered in season, it falls to the ground. This facility for the distribution of the seed is one cause of the very general diffusion of grasses.

The *roots* of grasses are fibrous, and increase in proportion as the leaves are trodden down, or consumed; and the stalks which support the flower are seldom eaten by cattle, so that the seeds are suffered to ripen. Some grasses which grow on very high mountains where the heat is not sufficient to ripen the seed, are propagated by suckers or shoots, which rise from the root, spread along the ground, and then take root themselves; grasses of this kind are called *stoloniferous*, which means bearing shoots. Some others are propagated in a manner not less wonderful; for the seeds begin to grow while in the flower itself, and new plants are there formed, with little leaves and roots; they then fall to the ground, where they take root. Such grasses are called *vivip'arous*, which signifies producing their offspring alive, either by bulbs instead of seeds, or by seeds germinating on the plant. The seeds of the grasses have but one lobe, or are not naturally divided into parts, like the apple seed and the bean; therefore these are said to have but one cotyledon.

The stamens of gramineous plants like all monocotyledons, are of that kind which grow internally, or from the centre outward, and are therefore called *endogenous*.

With regard to the duration of the grass-like plants, some are annual; as, wheat, rye, and oats, their roots dying after the grain or seed is matured. The meadow grasses are perennial; their herbage dying in autumn, and the roots sending out new leaves in the spring.

The grasses are distributed into a great number of genera, *chiefly distinguished by the different forms of the corollas, and the shape of the valves.*

The essential character of the oat, (Avena,) consists in the jointed, twisted awn or beard which grows from the back of the

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Roots of the grasses—

blossom; it is also remarkable for its graceful pannicle, or the manner in which its flowers grow upon their stalks.

The rye, (Secale,) has two flowers within the same husk. The wheat, (Triticum,) has three; the interior valve of the corolla of the wheat is usually bearded. The filaments in the rye and wheat are *exsert*, that is, they hang out beyond the corolla; from which circumstance, these grains are more exposed to injury from heavy rains than others whose filaments are shorter.

Perhaps, in the whole of the vegetable kingdom, although there are many plants of much greater brilliancy of appearance, there are none which are so important to man as the gramineous family. This is supposed to include nearly one sixth part of the whole vegetable world. Grasses cover the earth as with a green carpet, and furnish food for man and beast. Some of the grasses most valuable as furnishing food for cattle, are herdsgrass (Phleum *pratense*,) and meadow grass (Poa,) orchard grass, (dactylis,) and oats. Those which are used in various ways as food for man, are wheat, rye, barley, and indian corn; this latter, botanically called Zea *mays*, although of the natural family of the grasses, having a culm-like stalk and other distinguishing characteristics of grass-like plants, is yet placed in the class Monœcia, as the stamens and pistils are separated in different flowers, growing from the same root. The styles, long, slender, and *exserted*, form what is called the *silk:* they are thus favorably situated for receiving the fertilizing pollen which is showered down from the staminate flowers.

The fruit of corn, wheat, rye, &c. is called grain. Grain then consists of the seed with its pericarp; these are not easily distinguished from each other till the grain is ground into flour; the pericarp separating from the seed then forms what is called the *bran*, and the seed the *flour* or *meal*.

The sugar cane, (Saccharum *officinarum*,) is of the grass family, it is supposed to have been brought from the South of Europe to the West Indies. The stem or culm, which sometimes grows to the height of twenty feet, affords the juice from which the sugar is made.

The Bamboo, (Arundo *bambos*,) of the East Indies, a species of reed, which is said to attain in some situations, the height of sixty feet, is also of this class. The Sedge, (Carex,) is a gramineous plant, but it bears staminate and pistillate flowers, and is therefore placed in the class Monœcia. The carexes* constitute a very numerous family of plants. To assist you in analyzing the grasses, we have here a drawing of the Dactylis *glo-*

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* The plural of *carex* according to the Latin termination is *carices.*

Importance of grass like plants.—Sugar cane—Bamboo.

merata† or orchard grass. We first notice the different parts which belong to the flower.

1. CALYX,‡ two-valved, compressed, keeled,‖ acute, one valve shorter than the floret, the other longer.
2. COROLLA, two-valved, compressed, oblong, acute, one valve within the larger valve of the calyx, keeled.
3. STAMENS, filaments, three of the length of the corolla, anthers two-forked.
4. PISTIL, *germ*, egg-shaped, *styles*, two, spreading and feathery.
5. PERICARP, wanting, the scales of the corolla enclosing the seed, and afterwards opening and throwing them out.
6. SEED, a single one, flattened on one side, and convex on the other, naked, or without any kind of appendages.

The other parts of the plant are,

1. STEM, a culm or straw, cylindric, jointed.
2. LEAVES, long, and narrow, pointed, simple, entire, surrounding the culm at their base, and thus forming a kind of sheath.
3. FLOWERS, thick, panicled, terminal.

This is a very common grass in the New England and Middle states.

Of all the grasses, the darnel, (Lolium,) only is poisonous; this seemed to have been avoided in the days of Virgil, who, in his "Pastorals," represents the shepherds as speaking of the lolium as destructive to their flocks.

CLASS IV—TETRANDRIA.

The same number of stamens are found in the plants of this class, as in those of the 13th class, Didynamia. In the fourth class the stamens are of equal length, but in the thirteenth they grow in two pairs of unequal length.

ORDER MONOGYNIA.

The first order of the fourth class is divided into five sections, as follows:

First, flowers with *one petal*, situated *below* the germ.

Second, *above* the germ.

Third, flowers *four petalled below* the germ.

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† Glomerata signifies a cluster, alluding to the crowded panicles of flowers.

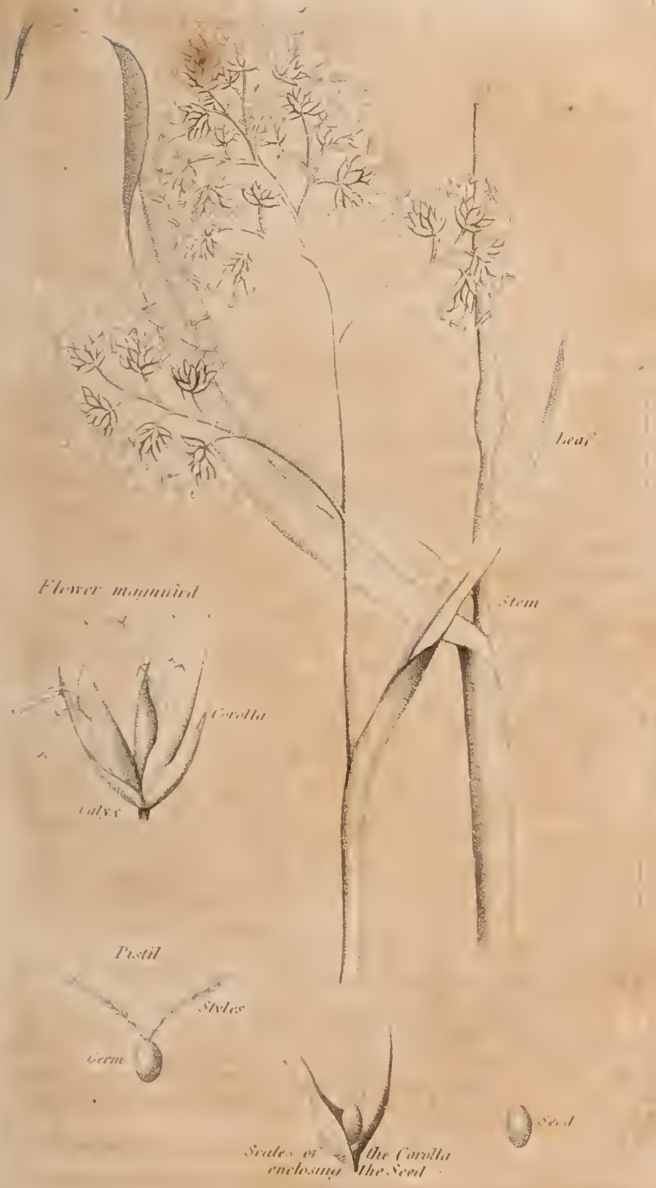
‡ The parts of the calyx, and also of the corolla, are called glumes; they are all much alike in appearance, being merely a set of sheaths, for the purpose of protecting the stamens; they are not distinguished by any difference in colour from the leaves or stem. The anthers, which are usually yellow, are the only part of the blossom of the grasses which is coloured.

‖ Resembling the keel of a boat.

Analysis of the orchard grass—Class Tetrandria—Order Monogynia—How divided.

ORCHARD GRASS

PLATE X.



DACTYLIS GLOMERATA.
Class III. Order II.

Fourth, petals *above* the germ.

Fifth, flowers that have *no corolla*, and therefore called *incomplete*.

As an example of the first order may be mentioned, the HOUSTONIA *cærulea*, which is known by different common names; in some sections of the country it is called *Innocence*, in others Venus' Pride, and in some Blue Houstonia. It is a very delicate little flower, appearing early in the spring in grassy fields and meadows; the colour varies from sky blue (which gives its specific name *cærulea*) to a pure white. The flower has a small calyx, with four divisions; a monopetalous corolla of four divisions, which give it something the appearance of a cruciform plant.

The common Plantain, (Plantago,) is found here; it is a plant by no means useless, although it exhibits nothing interesting to gratify the sight. The leaves are sometimes used in external applications for medicinal purposes; they are also, when young and tender, boiled and used for food in some parts of the United States. The flowers of the plantain grow on a spike; they are very small, but each one has a calyx and corolla, which are both divided into four parts; the filaments are very long, and the pericarp is ovate with two cells. Canary birds are very fond of the seeds of the plantain.

Aggregate flowers. We find in this class the *aggregate* flowers, (*aggregatæ*,) such as have many flowers on the same receptacle; they have a general resemblance to the compound flowers of the class Syngenesia, but differ from them in having but four stamens with anthers separate, while the Syngenesious plants have five united anthers. The aggregate flowers are not often yellow, like many of the compound flowers, but are usually either blue, white, red, or purple. The Buttonbush, (Cephalanthus,) of about five feet in height, affords a good example of the natural order *aggregatæ*. The inflorescence is white, appearing in heads of a globular form, each consisting of many little perfect florets; each head has its own four cleft calyx, but there is no general calyx, or involucrum for the whole. But one species of this genus, *occidentalis*,* is known, and this is entirely confined to North America. The Teasel, (Dipsacus,) belongs to the aggregate flowers; its inflorescence is in heads of the form of a cone; it is furnished with narrow, stiff leaves in the wild Teasel; in the species which is cultivated these bristly leaves are hooked; on this account they are used by clothiers

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* From *occidens*, the west, being found on the western continent.

Houstonia—Plantain—Aggregate flowers, including button-bush and teasel.

to raise a nap or furze on woollen cloth. The *Cornus*, so called from a Latin word *cornu*, a horn, on account of the hardness of the wood, is a genus composed mostly of shrub-like plants, with flowers growing in flat clusters or *cymes*, like the elder. The *florida*, a species of Cornus, often called Box-wood, sometimes Dog-wood tree, is a beautiful ornament of our woods. It may be considered either a large shrub or a small tree; it grows from the height of fifteen to thirty feet. Its real corollas are very small, and are clustered together in the manner which is called in botany an aggregate. This aggregate of flowers is surrounded by that kind of calyx called an *involucrum*, which, in this plant, consists of four very large leaves, usually white, but sometimes of a pale rose color; to the latter circumstance is owing its specific name *florida*, or florid. You would no doubt, on the first sight of this plant, mistake the large leaves of the involucrum for the petals.

Another very common genus of the class Tetrandria, is the Bed-straw, (Galium,)an herbaceous plant, with very small white flowers, the leaves grow in whorls or rings; in different species, the leaves thus clustered together stand around the stem-leaves in fours, fives, sixes and eights. Some species exhibit a peculiar roughness upon the stems and leaves. This genus with many others of the class, belongs to the natural order *Stellatæ*,* or starry plants; the leaves radiating from the stem as rays of light from a star.

Among the exotics of this class, are the SANTALUM which produces the *sandalwood*, and the Madder, (Rubia *tinctoria*,) the root of which produces a beautiful scarlet color. The latter plant is said to have the singular property of tinging with its red color, the bones of the animals that feed upon it. This is one of the starry plants, belonging to the order Stellatæ of Linnæus; but Jussieu has arranged this and some of the plants whose leaves grow in whorls, under his 57th order, which he calls Rubiaceæ. The Silver tree, PROTEA *argentea* has soft leaves, resembling satin of a silver color. Another species of *Protea*, the *aurea*, has gold colored leaves, which are edged with scarlet. Both these trees are natives of the Cape of Good Hope, and have never been found in any other locality. The other orders of this class are not particularly interesting or important.

* From *Stella*, a star.

Cornus—Bed-straw—Madder—Protea orgenlea.

LECTURE XXV.

CLASS V.—PENTANDRIA.

The class which we are about to examine is said to comprehend more than one tenth part of all known species of plants. It differs from the class Syngenesia in having its five stamens separate, while the Syngenesious plants have the same number of stamens united by means of their anthers. Plants with five stamens, including those which have anthers united, are said to constitute one fourth part of the vegetable kingdom.

ORDER MONOGYNIA.

There are six orders in the class Pentandria, the first of which, Monogynia, is large and important. Here we find the 41st natural order of Linnæus, the *Asperifoliæ*, a name derived from two Latin words, *asper*, rough, and *folium*, leaf, signifying rough leaved plants. These have monopetalous corollas, with five stamens and five naked seeds. The seeds are *dicotyledons*; this natural family is found in the 8th class of Jussieu, and by him is called *boragineæ* from the genus Borago. "The change in the corolla of these plants, in general, from a bright red to a vivid blue as the flower expands, apparently caused by the sudden loss of some acid principle, is a very curious phenomenon."*

The *Cynoglossum* is perhaps as common as any of the *asperifoliæ* or rough leaved plants. Its common name is hound's tongue, so called from its soft oval leaves, which are thought to resemble the tongue of a dog. Although the Cynoglossum is classed with the rough leaved plants, its leaves are remarkably soft, appearing to the touch like velvet; it is about two feet high, the flowers are of a reddish purple, growing in panicles. The Lungwort, (Pulmonaria,) which also belongs to this natural family, has two species in North America with smooth leaves. The Mouse-ear, (Myosotis,) is valued for its medicinal properties; a species, the *arvensis* or Forget-me-not, is an interesting little blue flower. The *Gromwell*, (Lithospermum,) is a rough

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* Smith.

Class Pentandria—How different from the class Syngenesia—Order Monogynia—Natural family—Asperifoliae—rough leaved plants, including Hound's tongue, Lungwort, Gromwell, and Borago.

plant with white flowers; the bark of the plant contains so much silex or flinty matter, as to injure the sickles of the reapers, when it grows in the field with the grain. The names Lithos permum, is from the Greek *Lithos* a stone, and *sperma* a seed, in allusion to the hardness of the seeds. The *Borago*, which gives its name to Jussieu's Natural family, including rough leaved plants is an exotic, very common to our gardens. The corolla is wheel-shaped, of a beautiful blue color, having its throat closed with five small protuberances; the same is observable in the cynoglossum and some others of this class; the stamens are attached to the tube of the corolla; you must take off the corolla carefully and you will see both the little scales which choaked up the throat of the corolla, and the manner in which the five stamens grow to it.

The *Luridæ*, from *lurid*, signifying *pale* or *livid*, are in the 28th natural order of Linnæus; this order is by Jussieu included under his 41st, the Solaneæ. The general characters of these plants are monopetalous corollas, of a lurid or pale appearance, flowers with five stamens attached to the basis of the corolla, and alternately with its divisions; the leaves are alternate. The common Potatoe, (Solanum *tuberosum*,) is of this natural family, the flowers of this plant are large and the organs very plain for analysis. There is a peculiarity in the appearance of the anthers which it is well to notice; they are of an oblong form, thick and partly united at the top, forming a cone, and instead of opening at the side, as anthers usually do, they open at the top by two pores. The potatoe was not known in Europe, until after the discovery of America. In the year 1597 Sir Walter Raleigh on his return from this country, distributed a number of potatoes in Ireland, where they became numerous and the cultivation of them soon extended into England. It is said that the root of the potatoe is white or red according to the color of the flower. The little green balls, upon the stalks of the potatoe, are the pericarps, and contain the seed; but this plant is usually produced from the root. The little knobs or eyes which you may notice upon the potatoes, are each one a kind of germ or bud; and in planting potatoes the whole root is not put into the ground, but cut into as many pieces as there are eyes, each one of which produces a plant.* In the same genus with the potatoe is found the Tomato and the Egg plant.

* This is more properly a *continuation* of the plant than a *reproduction*; it is observed that the vegetable thus continued appears in process of time to become degenerated, and it is necessary to renew the race by reproducing it from seed.

Natural family—Luridae or Lurid plants—Potatoe.

In this natural family is the Datura *stramonium*, a large, ill looking, nauseous scented weed, with a funnel form, plaited corolla, either white or purple, with broad, dark-green leaves; when the corolla falls off and the germ matures, it then becomes a large, ovate, thorny pericarp, often called Thorn-apple; it continues to blossom during the summer, is found by the sides of roads, around old buildings and waste grounds. Yet even this disagreeable plant has an important use; it is, on account of its narcotic, and other active properties, highly valuable in medicine.

In the group of plants we are now considering, is the Tobacco, (Nicotiana *tabacum.*) This is a native of America; it was imported into Europe about the middle of the 16th century. It was presented to Catharine de Medicis, Queen of France, as a plant from the new world possessing extraordinary virtues. The generic name Nicotiana is derived from *Nicot*, the name of the person who carried it to France. King James 1st of England had such a dislike to the fumes of this plant, that he wrote a pamphlet, which he called a "Counter blast to tobacco." It is highly narcotic, the excessive use of it, producing sleep like opium. The oil of tobacco, when applied to a wound, is said to be equally fatal as the poison of a viper.

The Mandrake, (Atropa *mandagora*,) was much used by the ancients as an opiate; they had many absurd notions respecting this plant; they fancied in its roots which are very large and of a peculiar appearance, a resemblance to the human form, and thought that some judgement would follow those who took them out of the ground. This superstition is not unlike that which is sometimes discovered even in the present day by those who are afraid to sow fennel, because they say it is "sowing sorrow." Perhaps those very persons who would thus fear to perform acts so innocent as to take a root from the ground, or to put seeds into it, would have no hesitation in violating a command of God, or neglecting to perform their known duties.

The Atropa *mandagora* or Mandrake, must be distinguished from the mandrake which grows in our country; the latter bears a fruit which is pleasant to the taste and perfectly inoffensive. The botanical name of the American mandrake is Podophyllum, it is found in the class Polyandria. You can see in this instance the importance of botanical names being given in a language which shall be the same in all countries. The common name mandrake has been given to two plants essentially different; but by a uniformity in the scientific names, there is no danger of one being taken for the other by those who know any thing of botany.

Tobacco—Mandrake or Atrapa.

Along with the Potatoe, the Stramonium, and the Atropa, we find the Mullein, (*Verbascum*,) which you must have seen too often to need any general description of its appearance ; but though its *natural characters* may have so far attracted your attention that you know a mullein from every other plant, you may not have examined its different parts with a view to scientific arrangement; we will tell you that it has, like all the Luridæ, a five parted calyx, wheel-shaped corolla, with five unequal divisions. The stamens are *declined* or turned downwards, bearded, or hairy. The capsule is two-celled and many seeded. The leaves are *oblong*, *acuminate* and *decurrent*, or with their bases extending downwards around the stem ; they are downy on both sides. The flowers are arranged along on their stem in such a manner as to constitute what is called a *spike*. The botanical name of the common mullein is VERBASCUM *thapsus*, a species smaller and more delicate than the common mullein, is often found in woods; this is the VERBASCUM *blattaria*. This genus is less active in its medicinal properties than most others of the lurid family ; it is said to possess anodyne properties, and to be intoxicating to fish.* We cannot at present enumerate all the plants of this extensive natural family ; but as you proceed in your analysis of plants, you will do well to refer them to their natural orders, and thus you will in time become familiar with the natural, as well as artificial classes.

Having remarked upon the natural families *Asperifoliæ* and *Luridæ*, we proceed to consider some other genera of the class Pentandria.

In the family *Lysimachi*, are several genera with wheel-form corollas ; the most important genus in this family is the Lysimachia, or Loose strife, an herbaceous plant very common in June and July ; several species of it may be found along the banks of little brooks, and low meadow grounds.

The *racemosa*, or cluster-flowered loose-strife is from one to two feet in height ; it bears a profusion of fine yellow blossoms, in a lax or limber raceme. It sometimes bears bulbs in the axils of the leaves, and small branches. These bulbs, like the roots of the crocus and onion contain the rudiments of a plant.

The St. John's wort, Hypericum, a very common and numerous family, is in this same natural order.

The first order of the class Pentandria, contains besides the plants we have enumerated, the morning glory, (Convolvulus,) the honeysuckle, and the genus Ribes, which contains the currant and gooseberry. The coffee, (Coffea *arabica*) is also in this class and order. This plant is a native of Arabia; it is said to be used to a great extent by the Turks and Arabs, to counteract the narcotic effects of opium, which they use in large quantities. It is remarked by a physician, that the question is often asked, which is best for the health, to use tea or coffee: he thinks the question a difficult one to answer. The Turks, who drink great quantities of coffee, and the Chinese, who make equally as free use of tea, do not exhibit such peculiar effects as renders it easy to decide, that one is more injurious than the other.

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* Smith.

We find in this order a natural family, called Contortæ, on account of their twisted corollas; the Perewinkle, (Vinca,) is an example.

Before closing our remarks upon the first order of the 5th class, we will remind you that the wine grape is found here; it is in the 72d order of Jussieu, Vites.* The general character of the grape, (Vitis,) is a calyx five toothed, petals connected at the top, a five seeded, round pericarp. The stamens and pistils are, in some genera, diœcious, or on separate plants; this according to our principles of classification, would carry the genus into the class Diœcia; but as some species of the genus have perfect flowers, containing five stamens and one pistil, and as it is never permitted to separate the different species of a genus, we take the diœcious species, which are less numerous than the pentandrous, into the fifth class.

The regions which produce the wine grape have a mean annual temperature† of 50 degrees on the northern border and 59 degrees on the southern. Lines of temperature have been described by Humboldt, by remarking the peculiar vegetables in different countries. He has traced the northern limit of the wine grape, where the mean annual temperature is about 50°, from near the latitude of Albany across the United States, to the Pacific ocean; not however in a straight line, for climate, although chiefly dependent on latitude, is yet much modified by other circumstances; and on the western coast of America we find in

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* Vines.

† By mean annual temperature, is meant a medium between the extremes of heat and cold. In a climate where the thermometer in summer would rise to 100 degrees, and in winter sink to zero or 0, the medium would be 50 degrees; this is probably not far from the mean annual temperature of our climate. The mean annual temperature at the equator is reckoned to be about 84 degrees.

Coffee—Natural family, controtae, or twisted corollas—Wine grape of the natural order—Vites—Temperature of the regions which produce the wine grape.

latitude 50°, a similar climate, to the 43d degree of latitude on the eastern coast. Thus the wine grape may grow in 50° of latitude, near the lakes, the Mississipi, and Pacific ocean; while, in the eastern part of New York and New England, it would not thrive beyond the 43d degree of latitude.

We find, on the other side of the Atlantic, the region of the wine grape, including France, and the southern countries of Europe, extending as high as latitude 50°.

The southern limit of the wine grape where the mean annual temperature is about 59°, is traced from Raleigh, in the United States, in latitude 35°, to Europe, where it passes between Rome and Florence, in latitude 44°; this line is the boundary between the grape region and that of the olive and fig, which you know, require a higher temperature than the grape.

The banks of the Rhine produce excellent grapes, which are brought down the river in great quantities to the seaports. The festival of the *Vintage*, or the gathering of the grapes, which, like our *Thanksgiving* season, is intended as a manifestation of gratitude for the fruits of the earth, was celebrated with much joy by the ancient Romans, and is still observed by the people of Italy; it occurs with them about the beginning of September; in France and the south of Germany, it is later.

The Fallernian wine was the most celebrated among the Romans; some of the Latin poets spoke of it oftener than we should expect from those, whose intellectual taste might seem to elevate them above any very great attention to the gratification of the external senses. The number of wines in use, in the days of Virgil, was such, that he said he might as well attempt to count the sand on the shore, or the billows of the ocean in a storm, as to make a catalogue of them.

The vines of Italy, are often trained upon trees, particularly upon the lofty Elm. In France, the vineyards have short poles, about the length of bean poles. The appearance exhibited by a luxuriant vineyard is truly rich and beautiful; of those of France and Italy, it may well be said,

> "The vine her curling tendrils shoots,
> Hangs out her clusters, glowing to the south,
> And scarcely wishes for a warmer sky."

It is said, the Persian vine-dressers endeavour to make the vine run up the wall, and curl over on the other side, which they do, by tying stones to the extremity of the tendrils. A writer remarking upon this, thinks it may illustrate a passage in Genesis. "*Joseph is a fruitful bough; even a fruitful bough by a well;*

Festival of the vintage.

whose branches run over the wall." "The vine, particularly in Turkey and Greece, is frequently made to entwine on trellises around a well, where, in the heat of the day, whole families collect themselves and sit under their shade." In this class and order is the violet (*viola*) a genus which contains many native species. The garden violet is the *viola tricolor*. It has a variety of common names as pansy, hearts ease, &c. Pansy is a corruption of the French *pensee* a thought; thus Shakespeare in the character of Ophilia says,

"There's rosemary, that's for *remembrance;*
and these are pansies;
That's for *thought.*"

Shakspeare also calls the same flower *Love in idleness.* Poets are very fond of the Primrose (Primula) so called from *primus*, first, on account of its early appearance in the spring. But the primrose of the poets is not a native plant with us. The cinnamon rose of the genus Rosa is frequently, though improperly called primrose.

The English cowslip is a species of Primula, having the segments of its corolla spotted with a rich yellow color, which Shakspeare seemed to suppose contained the fragrance of the flower. Thus in the Midsummer Night's Dream; the Fairy says,

"I serve the fairy queen,
To dew her orbs upon the green:
The *cowslips* tall her pensioners be;
In their gold coats spots you see;
Those be rubies, fairy favours,
In those freckles live their savours:
I must go seek some dew drops here,
And hang a pearl in every cowslip's ear.

The American cowslip belongs to the 13th class, genus *Caltha.*

LECTURE XXVI.

CLASS PENTANDRIA CONTINUED.

ORDER DIGYNIA.

In this order of the fifth class is the family *Gentianæ*, which affords some delicate flowers, as well as medicinal plants. The

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Violet—Primrose.—Order Digynia, or second order of class Pentandria.

fringed gentian is a beautiful plant with a blue flower. This genus sometimes presents an irregularity in the number of stamens. The pigweed, (Chenopodium,) notwithstanding the low esteem in which it is usually held, you will see, is dignified with a long and high sounding name. Shakspeare says, "A rose, by any other name would smell as sweet;" so, notwithstanding its great name, the pigweed is a very uninteresting plant; it is grouped by natural characters with the beet and dock, flowers which are destitute of beauty.

The Umbellate plants which belong to the order and class we are now considering, have already been described under the 12th class of Jussieu's arrangement; having dicotyledonous seeds, and stamens *epigynous* or standing upon the germ. They have five stamens, five petals, and two styles. The fruit divides perpendicularly into two seeds, which hang from the top of a thread shaped receptacle. Parsley, fennel, &c belong to this natural family. The water cow-bane, (CICUTA *virosa*,) grows in ponds and marshes, and is a deadly poison. Cows are often killed in the spring by eating it; but as the summer advances, the smell becomes stronger, and they carefully avoid it. Linnæus relates, that in a tour made into Lapland for scientific purposes, he was told of a disease among the cattle of Torneo, which killed a great many of them in the spring, when they first began to feed in the pastures. The inhabitants were unable to account for this circumstance; but the Swedish botanist, examining the pastures, discovered a marsh where the CICUTA *virosa* grew in abundance; he acquainted the people with the poisonous qualities of the plant, and thus enabled them to provide against the danger, by fencing in the marsh.

In the same family is the Poison-Hemlock, (CONIUM *maculatum*,) which has a peculiarly unpleasant, nauseous smell; its stalk is large and spotted, from whence its specific name *maculatum*, which signifies spotted. This plant is supposed to be the poison so fatally administered by the Athenians to Socrates and Phocion.

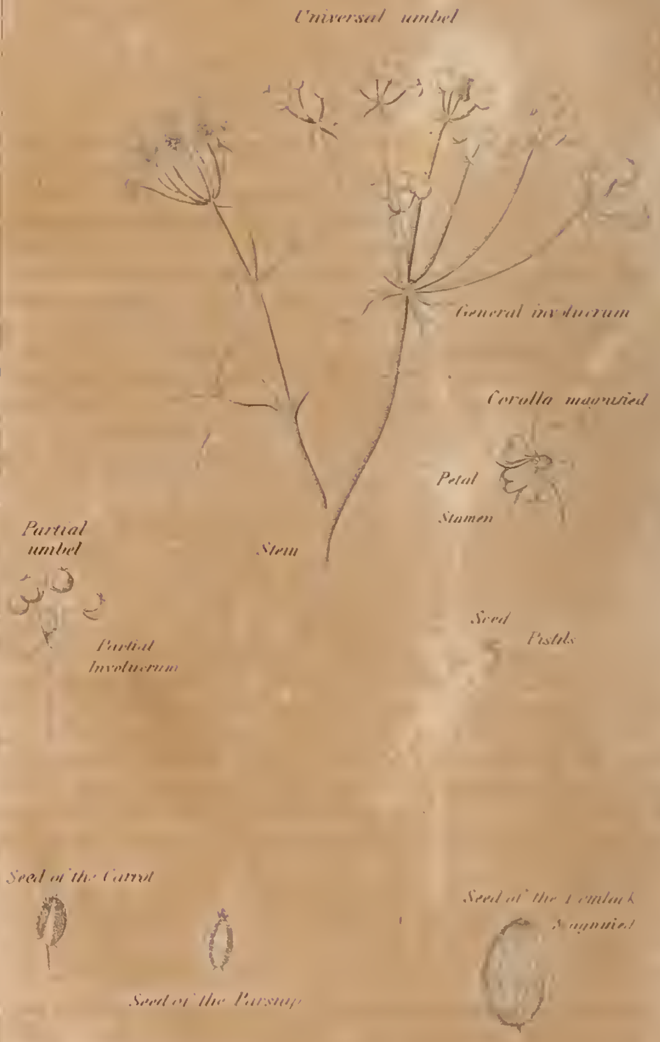
Before we leave the Umbellate plants, as they are not so simple of analysis as many others, we will present you with a drawing, which may assist you in understanding their general character.

We have here a sketch of the Coriander:—

1. CALYX. This is of that kind called an *involucrum*; the leaves which you see at the foot of the *universal umbel*, form what is called the *general involucrum*; the leaves, which are at the foot of the *partial umbel*, form a *partial involucrum*. Both of these involucrums are *pinnatifid* or have the leaves divided.

Fringed gentian—Pigweed—Umbellate plants—character of these plants —Water Cowbane—Poison Hemlock—Analysis of Coriander.

CORIANDER PLATE



PENTANDRIA DIGYNIA

Class V. Order II.

2. **Corolla**, this is represented as magnified, you can see that it has five petals *inflected*, or bent inwards.
3. **Stamens**, five, anthers somewhat divided.
4. **Pistils**, two *reflected*, or bent back, as may be seen on the seeds, where the stigmas are permanent.
5. **Pericarp**, is wanting, as in all umbellate plants.
6. **Seed**, is round, with its two styles at the summit.
7. Stem, is herbaceous, branched.
8. **Leaves**, narrow, pinnatifid.
9. **Flowers**, terminal, umbelled.*

We have before remarked that the form of the seeds is of importance, in distinguishing the genera of the umbellate plants; we therefore give you, in the drawing, examples of the seeds of several plants.

The umbellate plants, although in some cases poisonous, supply us with valuable vegetables for food; as the parsnip, carrot, and celery. The roots and stalks of the Angelica, in Greenland, where they have but a scanty supply of food, are eaten and considered as a great delicacy.

Dill, fennel, coriander, and carraway, are used in confectionary, and are also made subservient to many valuable medicinal purposes.

The milk-weed (*asclepias*) is by many writers placed here; but as its five stamens seem evidently situated upon the pistil, the genus is properly placed in the fifth order of the class Gynandria.

TRIGYNIA.

This order contains the elder, (Sambucus,) a shrub, which with its clusters of delicate white flowers, ornaments the fields during the summer. From the appearance of the blossom you might suppose it to be unbelliferous; the stalks do at first radiate from one common centre, but afterwards they are unequally subdivided; this arrangement of flowers is called a *cyme.* The dark rich purple berries of the elder, and the peculiarity of its pithy stem, are among its distinguishing natural characters.

The snow-ball, (Viburnum,) has a natural affinity with the elder: the flowers in its *cymes* are more thickly clustered together. Both are distinguished by their flat corollas; which are somewhat like a flat round piece of paper, with five divisions notched on the border. The only generic difference between the

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*The description of this plant is given on the authority of Nuttall who calls it the American coriander, which he says is found in the neighbourhood of the Red River. The cultivated coriander has but a one leafed involucrum.

Umbellate plants used for food—For confectionary and medicine—Order Trigynia—Elder—Snowball.

snow-ball and the elder is, that the former has a berry, or pericarp, with one seed, the latter with three.

TETRAGYNIA.

Here we find the grass of Parnassus, (Parnassia.) This is an interesting flower in its appearance; its leaves are white, and beautifully veined with yellow; the stem produces but one flower; the nectaries are remarkable for their beauty and singular appearance; they are five in number, heart form, and hollow, surrounded with thirteen little threads, each one terminated with a round glandular substance. The name is said, by an English Botanist,* to have arisen from the plant being a native of Mount Parnassus, in Greece, anciently considered as the dwelling of the muses. It is found in North America.

PENTAGYNIA.

In the fifth order, we find the flax, (Linum,) so called from a Celtic word *lin*, a thread. The flax has a showy blue flower, with an erect stem; a field of it in blossom presents a very beautiful appearance. The cultivated species is said to be an exotic, of Egyptian origin. It is from the liber, or inner bark of the stem of this plant, that all linen cloths, the finest lawn and cambric, are manufactured. We owe to it in one sense our literature; for the paper of which our books are made, is primarily derived from flax. The fibres of the stem are not only thus important to the comfort of man, by contributing to his clothing, and to his intellectual improvement, in furnishing a method of disseminating knowledge, but the seeds are highly valuable for their oil, called lin-seed oil. This is used in medicine; and the delightful performances of the artist are executed by means of colors, prepared with oil from the seed of the flax, laid upon the canvass made from the fibres of its stems.

POLYGYNIA.

The thirteenth order occurs next to the fifth; there being no plants in the class Pentandria with six, seven, and eight pistils, &c, until we come to the yellow root, (Zanthoriza,) which is a native of the Southern States. It has 5 stamens, 13 pistils, no calyx, 5 petals, 5 nectaries, capsules 5 seeded; the flowers are

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* Thornton.

Order Tetragynia—Grass of Parnassus—Order Pentagynia—Flax—Order Polygynia—Zanthoriza—

purple, growing in panicles. It is a low shrub, with a yellow root, sometimes used by dyers.

Our investigations into the class Pentandria have necessarily been somewhat tedious, on account of the number and importance of the plants which it contains.

We do not, however, expect to make you practical botanists by introducing to your notice a few interesting plants; this can only be done by gathering flowers, and examining them according to those rules of analysis which we have endeavored to explain in a simple manner. If you study flowers, you will read remarks upon them with pleasure and profit; if not, definitions or instruction will be read with little interest and little improvement. Sciences may be unfolded, every facility which books and teaching can give, may be placed before the youthful mind; but that *mind* must itself be active, or the seeds of knowledge will no more take root and expand, than the seeds of plants would vegetate if thrown upon the bare surface of a rock.

LECTURE XXVII.

CLASS VI—HEXANDRIA, AND CLASS VII—HEPTANDRIA.

You have already been made acquainted with the lily, as it was one of the first flowers you were taught to analyze; and, in a brief view of the liliaceous flowers, you have been presented with the most striking characters belonging to this family, which we might, following the example of great names, call an "*illustrious*" race. Pliny says, the "lily is next in nobility to the rose."* Linnæus called the liliaceous flowers "*Nobles* of the vegetable kingdom;" he also called the palm trees "*Princes* of India:" but in our republican country, where aristocratic distinctions are little regarded, we will not attempt to introduce these titles of nobility among the flowers.

In the class Hexandria, the symmetrical ratio between the number of stamens and the division of the other parts of the flower, is generally to be found. In the spiderswort, (Tradescantia,) which has 6 stamens, we find the corolla 3 petalled, calyx 3 leaved, and capsules 3 celled. In the third class, which has 3 stamens, the divisions are often 6.

In the lily, which has 6 stamens, there are 6 petals; 3 of these are exterior, 3 interior; the capsule is 3 sided, with 3 cells, and 3 valves; the seeds are arranged in 6 rows. This proportion of numbers seems to forbid the idea that this plant grew up merely by chance, without the agency of any designing mind. We are not to expect always to see the same symmetry in plants as has been here remarked. It is in the natural as in the moral world, that although every where around us we see such proofs of order and system as would manifest the superintending care of one Almighty Being; yet there are irregularities which we cannot comprehend: but although we may admire the *order*, we are not to say that even what seems *disorder* is formed without a plan.

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* "*Lilium nobilitate proximum est.*"

Introduction not all that is necessary for improvement.

Class Hexandria—Ancient titles of distinction among flowers—Symmetry of parts in the flowers of this class—Lily—

> " Shall little haughty ignorance pronounce
> His works unwise, of which the smallest part
> Exceeds the narrow visions of his mind ?"

The tulip has not, like the lily, any style, but its three parted stigma is attached to a three cornered germ. The corolla of the tulip is more expanded at the base than that of the lily. The stem of the tulip is never more than one flowered, while that of the lily usually has a number of flowers. Some native species of the tulip are found in North America, but those which you see in gardens are exotics. In no plant is the variation made by culture greater than in this; it is said, that of one single species, Tulipa *gesneriana*, one thousand and one hundred varieties are cultivated in Holland. About the middle of the seventeenth century, the rage for tulips was so great, that some were sold for four thousand dollars, and one called the Vice-roi, for ten thousand dollars; but this extraordinary traffic was checked by the law that no tulip or other flower should be sold for a sum exceeding one hundred and seventy five dollars.

Besides the liliaceons plants with bulbous roots, which include much of the beauty of our gardens, in the first order of the 6th class, are several genera which belong to the natural family Ensatæ, having sword-form leaves; as the spiderswort, a beautiful flower whose symmetry we have already remarked. Many tenderly cherished exotics have less elegance than this neglected American plant.

The snow-drop, which is one of the earliest flowers of spring, is of the same family. It may excite your astonishment to know, that in the class and order with so many splendid and beautiful flowers are the onion (Allium) and the bulrush (Juncus). But you must recollect that in this artificial system, if a flower has six separate stamens and one pistil, it is entitled to a place

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Tulip—Snow-drop—Onion and Bulrush –

in the 6th class and 1st order, even though this should place a very humble plant by the side of the most gaudy flower.

The genus Scilla is an exotic, containing the squill, a medicinal plant, and the hare bell of English poets; the latter is SCILLA *nutans*, or nodding; it abounds in the woods and glens of Scotland, and has a soft and elastic scape. Thus Scott says of the Lady of the Lake;

> "A foot more light, a step more true,
> Ne'er from the heath-flower dashed the dew;
> E'en the slight hare-bell raised its head
> Elastic, from her airy tread."

The flower which we term the hare bell is the Campanula rotundifolia; this is very common near water-falls, and upon rocks in other situations. The barberry, (Berberis,) is found common in New England; its stamens possess an unusual degree of irritability; they recline upon the petals, but upon touching the base of the filaments by any substance, they instantly spring towards the pistil.

You may have observed that although we have remarked upon the *beauty* of some flowers to be found in this class, nothing has been said of their *utility;* the truth is, that their beauty, as is too often the case with external beauty, constitutes their chief merit. When we compare the advantages which the world derives from the costly race of showy tulips with the utility of the humble flax, we feel that though we may admire the one, reason would teach us to prefer the other. You may from this, derive a moral lesson, which may suggest to your minds some truths, applicable to human beings as well as flowers.

The genus Convallaria presents many delicate and interesting species. The flowers of some are funnel-shaped, and such are usually called Solomon's seal. The garden Solomon's seal is very common. This name is supposed to have been taken from certain marks on its roots, resembling the impressions made by a seal. It has been much celebrated for medicinal properties.* The lily of the valley belongs to the genus Convallaria; its corolla is bell-form.

* Gerard, a very ancient botanist, has the following curious passage. "The root of Solomon's seal stamped, while it is fresh and greene, and applied, taketh away in one night or two at the most, any bruse, black or blew spots gotten by fals, or women's wilfulness, in stumbling upon their hasty husbands' fists, or such like."

The Genus Scilla—Hare-bell—Barberry—Flowers of this class more remarkable for beauty than utility—Genus Convallaria—Solomon's seal—Lily of the valley—

In this order of the sixth class are the Aloes and the fan palm, the fronds of which are of immense size.

We shall close this lecture by a few examples of the remaining orders of the class Hexandria, and a view of the very small class Heptandria.

DIGYNIA.

In the second order we find but one genus, Rice, (Oryza;) this belongs to the family of grasses described under the 3d class; but is separated from the other grasses as it has 6 stamens. No plant in the world appears of such general utility as an article of food as this. It is the prevailing grain of Asia, Africa, and the southern parts of America, and is exported into every part of Europe.

TRIGYNIA.

Here we find the genus Rumex, which contains the dock and sorrel; they have no corolla, but the six stamens and three pistils are surrounded by a six leaved calyx.

CLASS VII—HEPTANDRIA.

Monogynia.

The first order of this class contains the chick-winter-green, (Trientalis;) this plant has a calyx with 7 leaves, corolla 7 parted. One species of it is said to defend its stamens against injury from rain, by closing its petals and hanging down its head in wet weather.

The horse-chesnut, (Æsculus,) is a native of the northern part of Asia, and was introduced into Europe about the year 1500; it was not probably brought to America until sometime after the settlement of this country by Europeans. It is a small tree which produces white flowers, variegated with red, crowded together in the form of a panicle; the whole resembling a pyramid. In appearance it is very showy, the more agreeable to us as we have so few trees whose flowers are conspicuous. The blossom is very irregular in its parts, that is, its number of other divisions do not correspond with the usual number of stamens; the stamens, however, vary as to number. The seeds in form have a resemblance to chesnuts, but their taste is bitter. A very large species, the *pallida*, having pale flowers, is a native

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In this order sixth class Aloes and Fan palm—Order Digynia—Rice—Trigynia—Rumex—Class Heptandria—Monogynia—Trientalis—Horse chesnut—

of the southern and western states. The horse-chesnut exhibits in its buds in a very conspicuous manner the wooly envelope which surrounds the young flowers, the scales which cover this envelope, and the varnish which covers the whole. The wood of this tree affords a good subject for studying the formation and growth of woody or exogenous stems.

TETRAGYNIA.

There is but one plant with four pistils known in the class Heptandria; this alone constitutes the fourth order; its common name is lizard's-tail, (*Saururus*,) it has arrow shaped leaves, flowers destitute of a corolla, and growing upon a spike; it is to be found in stagnant waters.

HEPTAGYNIA.

The septas, a native of the cape of Good Hope, is considered as the most perfect plant in this class; it has 7 stamens, 7 pistils, 7 petals, a calyx 7 parted, and 7 germs, (one to each pistil,) which germs become 7 capsules, or seed vessels.

Heptandria is the smallest of all the classes; we do not find here as in most of the other classes, any natural families of plants; but the few genera which it contains not only differ in natural characters from other plants, but seem to have no general points of resemblance among themselves.

LECTURE XXVIII.

CLASS VIII—OCTANDRIA.—CLASS IX—ENNEANDRIA.

Monogynia.

The eighth class although not large contains some beautiful and useful plants. One of the first which we meet with in this class, is the scabish, (*Œnothera*,) sometimes called evening primrose. Many species of this are common to our country, some grow to the height of five feet. The flowers are generally of a pale yellow, and in some species they remain closed during the greater part of the day, and open as the sun is near setting. This process of their opening is very curious, the calyx suddenly springs out and turns itself back quite to the

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Tetragynia—Saururus—Order Heptagynia—Septas smallest of the class —Class Octandria—Order Monogynia—Evening Primrose—

stem, and the petals being thus released from the confinement in which they had been held by the calyx, immediately expand; there are few flowers which thus hail the setting sun, though many salute it at its rising! The flowers of the Œnothera are thickly clustered on a spike, and it is said that "each one after expanding once, fades and never again blossoms."* This singular flower has been observed in dark nights to throw out a light resembling that of phosphorus. The regularity of the parts of this flower renders it a good example of the eighth class; the different parts of its corolla preserve in their divisions the number four, or half the number of stamens. It has 4 large yellow petals, the stigma is 4 cleft, capsule 4 celled, 4 valved, the seeds are affixed to a 4 sided receptacle.

To the same natural family as the Œnothera belongs the willow herb, (*Epilobium*,) a very branching plant with red flowers and feathery seeds.

The cranberry, (*Oxycoccus*,) belongs to the same natural order, but having ten stamens is in the class Decandria; in this case, a natural affinity is made to yield to the artificial system. The fruit of the cranberry consists of large scarlet berries which contain an agreeable acid. The flowers are white, having a 4 toothed calyx, and corolla 4 parted. It is found in swamps in various parts of North America.

The Ladies'-ear-drop, (*Fuschsia*,) is a beautiful exotic. It has a funnel-form calyx, of a brilliant red color, the petals are almost concealed by the calyx, they are purple and rolled round the stamens, which are long, extending themselves beyond the colored calyx. This plant is a native of Mexico and South America, except one species brought from the Island of New Zealand. Ten species are said by horticulturalists to be cultivated, but some of them are probably rather varieties than distinct species.

The heath,† (*Erica*,) which contains many hundred species, is not known to be indigenous to this country; fifty species are said to have been introduced. The common heath has bell-form flowers, small and delicate, with the color pink or varying into other colors; the flowers intermixed with the delicate green of its leaves produce a fine effect. The kind of soil necessary to the growth of the heath, is peat earth; this is very common in England and Scotland, in which countries this plant abounds. The branches are used in England for heating ovens, and making brooms. In the Highlands of Scotland, the poor make

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* W. Barton.

† The term *heath* is said to have originated from an old Saxon word, alluding to the *heat* which the plant affords as fuel.

Willow herb—Cranberry—Ladies' Ear drop—Heath—

use of it to thatch the roofs of their cottages, and their beds are also made of it. The field in which this plant grows is termed a heath or heather.

> "The Erica here,
> That o'er the Caledonian hills sublime,
> Spreads its dark mantle, where the Bees delight
> To seek their purest Honey, flourishes;
> Sometimes with bells like Amethysts, and then
> Paler, and shaded like the maiden's cheek
> With gradual blushes; other while, as white
> As frost that hangs upon the wintry spray."

The Daphne is a rare plant; one species is called the Lace-bark tree, from the resemblance of its inner bark or *liber* to net work or lace. This bark is very beautiful, consisting of layers which may be pulled out into fine white web, three or four feet wide; this is sometimes used for ladies' dresses and may even be washed without injury. Charles I. of England was presented by the govenor of Jamaica with a cravat made of this web. The plant is a native of the West Indies.

The Nasturtion, (Tropœolum,) is a very commonly cultivated exotic. It has not a regularity of parts; the divisions of the corolla and calyx are not four or eight, which we might expect from its eight stamens, but consists of five petals. The fruit consists of three seeds; these are used for pickles. "The generic name, (Tropœolum,) signifies a *trophy plant;* this alludes to its use for decorating bowers, and the resemblance of its peltate leaves to shields, as well as of its flowers to golden helmets, pierced through and stained with blood."*

The *Second order* of the 8th class has few plants of importance.

The *Third Order* contains the Buckwheat, (Polygonum,) which is classed in the same natural order as the dock, pigweed, &c. "having flowers destitute of beauty and gay coloring." The genus is extensive, containing many plants which are considered as common weeds; the species, *fagopyrum*, is the true Buckwheat, the use of which as an article of food is too well known to need a remark. This plant is variable in its number of stamens; the fruit is one angular seed.

In the *Fourth Order* of this class is a very rare plant called Paris. It is said to have been named after Paris a prince of ancient Troy, who was remarkable for his beauty. In every part of the flower there is the most perfect regularity; the numbers four and eight prevailing in every division. It has 8 stamens,

* Sir J. E. Smith.

Lace bark tree—Nasturtion—Buck-wheat—Genus Paris.

4 pistils, 4 petals, a 4 leaved calyx, a 4 sided and 4 celled pericarp, which contains eight seeds, and 4 large spreading leaves at a little distance below the flower. The color of the whole is green.

CLASS IX—ENNEANDRIA.

Monogynia.

This is also a very small class. In the *First Order* we find the genus laurus, which includes the cinnamon, bay, sassafras, camphor, spice bush, &c. The bay, (laurus nobilis,) is a native of Italy; the Romans considered it a favorite of the Muses. The emperor Tiberius wore it not only as a triumphal crown, but as a protector against thunder; as it was thought that Jupiter had a particular regard for the plant. The laurel as well as the olive was considered as an emblem of peace, it was sometimes called laurus *pacifera*, the peace-making laurel. If its branches were carried among contending armies it was a signal for the cessation of arms. Poets crowned with laurel were called *laureates.* Camphor is the produce of the laurus *camphora*, a large tree which grows in Japan; it is said that a species of this plant has been discovered in Georgia. " The LAURUS *cinnamomum* is a tree which grows to the height of twenty feet; it sends out numerous branches which are crowned with a smooth bark. The leaves are of a bright green, standing in opposite pairs. The petals are six, of a greenish white color. The fruit is a pulpy pericarp enclosing a nut. This tree is a native of Ceylon, where it grows very common in the woods and hedges. The cinnamon imported is the inner bark (*liber*) of the tree; it is remarkable that the leaves, fruit, and root all yield oil of very different qualities. That produced from the leaves is called the *oil of cloves*; that obtained from the fruit is of a thick consistence, very fragrant, and is made into candles for the use of the king; the bark of the roots affords an aromatic oil called the *oil of camphor.* " The Sassafras tree (laurus sassafras) is a native American plant; when first introduced into Europe, it sold for a great price, the oil being highly valued for medicinal uses. It grows on the borders of streams and in woods; it is often no larger than a shrub; its flowers are yellow, its fruit blue berries. The LAURUS *benzoin* has scarlet berries, and is an aromatic plant."*

The *Second Order* contains no remarkable plants.

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* Woodville.

Class Enneandria—Different species of the Genus Laurus, as the bay, camphor, cinnamon, sassafras, &c.

Trigynia.

The *Third Order* presents us with but one genus, which of itself renders the order important: it is the Rhubarb, (Rheum:) in one species the RHEUM *tartaricum;* the leaves are acid, and on this account, when young, are used for making pies; this is a native of Tartary, but now common in our gardens. The RHEUM *palmatum* is the plant which produces the medicinal rhubarb; this is obtained from the roots, which are thick, fleshy, and yellow. This plant is cultivated in England, and is remarkable for the rapidity of its growth. An English writer * asserts that its stem has been known to grow more than eleven feet in three months; that some of its leaves were five feet in circumference; that the root also grows to a great size; and that some had been carried to England which weighed more than seventy pounds.

We have now closed our considerations of the ninth class. You will recollect our lecture commenced with the eighth, which we found, though not a large class, to be an interesting one. The ninth, with the exception of two genera, laurus and rheum, presented few considerations of importance; the ninth, the seventh, and first, are among the smallest of the artificial classes.

We have dwelt somewhat at length upon exotics, because they are seldom described in botanical works in common use. If you become interested in the study of plants, you will naturally wish to know something about those which you are in the habit of using for food or medicine, or to which, as in the laurel of the ancients, allusions are often made in the books which you read.

It is important, however for you to seek for a practical knowledge of botany from the actual observation of our own native plants; to find them in their own homes, in the clefts of rocks, by the side of the brooks, and in the shady woods; it is there you will find nature in her unvitiated simplicity. We do not go to the crowded city to find men exhibiting without disguise the feelings of the heart. The flower transplanted from its rural abodes, though not a moral agent, and, therefore, incapable of moral transformation; yet exhibits in the splendid green house a physical metamorphosis, not less remarkable than the moral change which luxury too often produces upon the character of man.

* Woodville.

Order Trigynia—Different species of Rhubarb—Remarks upon some of the classes—Knowledge of exotics desirable—Flowers in their native situations.

LECTURE XXIX

CLASS X—DECANDRIA.

Plants of this class have ten stamens, but this circumstance alone would not distinguish them from some of the other classes; the number of stamens must not only be ten, but these must be distinct from each other; that is, neither united together by their filaments below, nor by their anthers above. Some of the classes which are to follow, viz: Monadelphia, Diadelphia, Gynandria, and the two classes with stamens and pistils on separate flowers, may also have ten stamens; but circumstances respecting the situation of these organs distinguish these classes from each other.

Monogynia.

In the *first order* of the tenth class we find some plants with papilionaceous or butterfly shaped corollas; these, because their filaments are not united, are separated from the natural family to which they belong, and which are mostly in the class Diadelphia. Among those which are thus removed from the class where, from their general appearance they might have been looked for, is the wild indigo, (Baptisia,) a handsome plant with yellow flowers, two or three feet in height, and very branching; the stem and leaves are of a blueish green. This is found in dry sandy woods; it has been used as a substitute for indigo.

The wild-pea, (Cassia) is another genus of the papilionaceous tribe. It has several species, one of which is called the American senna, (Cassia *marylandica*,) on account of its medicinal qualities. Another species is Cassia *nictitans*, with very small yellow flowers and beautiful pinnate leaves, which remain folded at night; it shrinks back from the touch, for which reason it is called the American sensitive plant.

A plant called by the Indians, Red-bud, (Cercis *canadensis*,) belongs to the same natural family. It is a large tree, appearing as early as April, loaded with clusters of fine crimson flowers; the leaves, which are large and heart-shaped, do not appear as early as the blossoms. The beautiful aspect of the tree attracts to it many insects, particularly humble-bees. A botanist* says, "I have often observed hundreds of the common humble-bees

*W. P. C. Barton.

Class Decandria—Not the only class with ten stamens—Order Monogynia—Contains some papilionaceous flowers—Wild indigo—Cassia—Cercis.

lying dead under these trees while in flower. Probably the flower contains something pernicious to them." This is not the only example of fatal consequences resulting from trusting too much to external appearances! This tree is not improperly called Judas' tree, a name by which it is often known.

The three genera of plants which we have now noticed, under the first order of this class, all bear fruit in that kind of pod called a *legume;* this is the case, in general, with the papilionaceous flowers.

In shady woods, where the soil is loose and rich, we find in June and July, the winter-green (Gaultheria,) a perennial plant which grows to the height of eight or ten inches; the pleasant taste of the leaves of this plant, and the still finer flavor of its fruit, are well known; the drooping blossom is also very delicate and beautiful, consisting of a bell-form corolla, (not unlike the lily of the valley,) the colour of which is white, tinged with pink. Though you may have often enjoyed eating the fruit and leaves of the winter-green, you will experience a delight which this mere pleasure of sense could not have afforded, when in your botanical rambles in the woods, you chance to meet with this plant in blossom, with its little flowers just peeping out from a bed of dry leaves: you may then enjoy the pleasure of a beautiful object of sight, with the higher enjoyment of intellectual gratification, by tracing in it, not only intrinsic beauty, but those characters which give it a definite place in scientific arrangement.

In the same natural family with the winter-green are two genera, Pyrola and Chimaphila, which by some botanists have been included under one; but they appear to be sufficiently distinct from each other to constitute a separate genus. These plants belong to the natural order Bicornes, or two horns; alluding to the two protuberances like straight horns, which appear on their anthers. The heath in the 8th class is of the same natural family, as also the whortleberry (Vaccinium,) which contains a great many species; the Europeans place this genus in the class Octandria, but an American botanist[*] says, "that of twenty five species in our country, not one is found with eight stamens, and in Europe only three species are known with that number." He very properly inquires, whether all our American species ought to be misplaced on account of those few European species. The cranberry, (Oxycoccus,) which was formerly

[*] Eaton.

Winter Green and other plants belong to the natural family Bicornes—Genus Vaccinium.

considered a species of the same genus as the whortleberry, as it has but eight stamens, is removed into the eighth class. Among the different species of the whortleberry is one with blue berries, another with very black berries, and the bilberry, which is a large shrub from five to eight feet high.

A great proportion of the plants in the first order of the tenth class are to be found in shady woods in June and July. We can here enumerate but few of them; in the description of the genera of plants which we have provided, you will be able to find the most common ones.

We will not, however omit to mention the Monotropa, a most curious little plant; several stems of a few inches in height, usually grow up in a cluster, each stem supporting a single flower, which, in form, resembles a tobacco pipe. The stems have scales upon them but no leaves: the whole plant is perfectly white and looks as if made of wax; it is sometimes called Indian pipe. You must look for this in shady woods near the roots of old trees, in June or the first of July.

Rhododendron, or as it is sometimes called the mountain laurel or rose bay, is an evergreen with large and beautiful oval leaves, found growing on the sides of mountains, or in wet swamps of cedar; it flourishes beneath the shade of the trees; the pink and white flowers appear in large showy clusters and continue in bloom for a long period; they have a 5 toothed calyx, a 5 cleft funnel-form, somewhat irregular corolla, stamens 10, sometimes half the number, capsule 5 celled, 5 valved.

Connected by natural relations to the rose bay or *Rhododendron* is the American laurel, (Kalmia,) a splendid shrub, sometimes found ten or thirteen feet high. On the Catskill mountains, it is said to have been seen twenty feet in height; the flowers grow in that kind of cluster called a *corymb;* they are either white or red, but this fair and beautiful shrub is of a poisonous nature, particularly fatal to sheep who are attracted towards it; one species of the Kalmia is on this account called sheep laurel.

Among the plants which have a place in this part of the artificial system, is the DIONÆA *muscipula*, or Venus' fly trap. This is a native of North Carolina; the leaves spring from the roots, each leaf has at its extremity a kind of appendage, like a small leaf doubled; this is bordered on its edges by glands, resembling little hairs, containing a liquid that attracts insects; but no sooner does the unfortunate insect alight upon the leaf, than with a sudden spring, it closes itself, and the little prisoner is crushed to death in the midst of the sweets it had imprudent-

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ly attempted to seize ; after the insect, overcome by the closeness of the grasp has expired, the leaf again unfolds itself. These movements are accounted for, by attributing to the plant a power of irritability, which is excited by the touch of any object. Although we account for the phenomenon by attibuting it to the irritability of the plant, we have only removed the difficulty by adducing a cause which itself remains to be explained. We shall in a future lecture make some remarks upon the irritability, or as it is sometimes called, sensibility of plants ; many curious and interesting facts, respecting this singular property of vegetables, may be collected ; many plausible theories to account for it have been given ; but the efficient cause is too deep for man to penetrate ; his feeble faculties cannot comprehend the designs and operations of Almighty Power.

The *Second Order* of the tenth class contains the *Hydrangea*, an elegant East Indian exotic ; a species of this plant, a shrub with white flowers, is said to have been found on the banks of the Schuylkill river.

The Pink (Dianthus) belongs to an extensive natural order, *Caryophylleæ*, which is distinguished by having five petals inserted with claws. One native species of the genus Dianthus, called *armeria*, or Wild pink, has been found in New-Jersey and New England.

The *Third Order*, or Trigynia, contains some plants which belong to the same natural order as the pink.

The *Fourth Order*, Tetragynia, is not important.

The *Fifth Order*, Pentagynia, produces a plant *Agrostemma*, known by the name of Cockle, this is very common in fields ; although troublesome and regarded but as a weed, it is a handsome pink-like plant, bearing a deep red or purple blossom ; in its genuine character it differs little from the pink genus, except in having five pistils instead of two, on which account it is placed in the fifth order.

Here is also found the Sorrel, (Oxalis,) which produces the oxalic acid, similar in its properties to the juice of lemons ; though poionous this acid is useful in taking the stains from linen.

In the *Tenth Order* is the Poke-weed, (Phytolacca,) a very common plant ; the fruit of which consists of large, dark berries, often used by children for the purpose of colouring purple. The young shoots are tender and are sometimes eaten as a substitute for asparagus. The flower of this plant presents us with 10 stamens, 10 styles, a calyx with 5 white leaves, resembling petals, a berry superior, (above the germ,) with 10 cells and 10 seeds.

We have now finished a review of the ten first classes, or the

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Dionaca—Hydrangea—Pink—Cockle—Sorrel—Poke-weed.

first group of classes, those which depend upon the single circumstance of the number of separate stamens; in our next lecture we shall consider the two classes which depend on the number and insertion of the stamens.

LECTURE XXX.

CLASS XI—ICOSANDRIA.

In the class now before us, the number of stamens is not the characteristic mark of distinction; this consists in the manner of the insertion of these organs. In the analysis of the rose, which belongs here, you have already become acquainted with the leading features of this class, and will, therefore, the less need a minute detail of these elementary distinctions.

Had we followed the classification, which has, until recently, been admitted by writers on botany, we should have had another class to examine before we came to Icosandria; this was called Dodecandria, from *Dodeka* 12, and *andria* stamen; it was not, as you might infer from the name, confined to 12 stamens, but contained from 10 to 20, without any regard to their insertion, as standing either upon the calyx or receptacle. This class produced confusion in the science of botany, for it is found that plants having more than ten stamens, frequently vary as to *their number;* and there being no difficulty in distributing all plants of this class into the two next, it has been by consent of most botanists left out of the classification; and the plants which it contained, arranged under Icosandria, if the stamens were *on the calyx*, and Polyandria, if the stamens were inserted upon the *receptacle.* The *manner of insertion is always the same*, and therefore, there can be no confusion with respect to determining the classes upon this principle.

You will observe that this omission of one class changes the numbers of the remaining classes; as Icosandria, which was formerly the twelfth, is now the eleventh, and so on with the other classes. It is on account of these changes that we wish you to learn the classes by their appropriate names, as Monandria, Diandria, rather than to confine yourselves merely to the numbers, as 1st 2nd, &c. Besides, the name of each class is generally expressive of its character; and will, when you understand its derivation, convey to you the idea of this character,

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Class Icosandria—Not distinguished by number of stamens only—Omitted class—Names of classes expressive of their character.

which, by the number alone, could not be done; for example, the term *eleventh class*, conveys no distinction but that of mere number; but the classical name Icosandria, (from Eikosi 20, and andria stamen,) means 20 stamens; this then reminds you of the circumstance on which the class is founded.

The name Icosondria, seems not, however, exactly well chosen to represent the eleventh class; because it is not confined to twenty stamens, having sometimes as few as ten, and in some cases nearly a hundred stamens. An American Botanist* has proposed to call the class *Calycandria*, from calyx† and *andria*, as the insertion of the stamens on the calyx is the essential circumstance on which the class depends; this name has been approved, but still the old name is used. Thus with respect to the name given to the great American Continent, all allow it should have been Columbia, after Columbus, its discoverer; but when once custom has sanctioned a name, it becomes very difficult to overcome this authority by arguments drawn from reason. We shall, therefore, in compliance with the use of botanists, call the class Icosandria.

The first genus which we meet with in this class is CACTUS; it contains many species; a very splendid one is the Night-blooming Cereus, (CACTUS *grandiflorus*,) having flowers nearly a foot in diameter, with the calyx yellow, and the petals white; they begin to open soon after the setting of the sun, and close before its rising, never again to blossom. Another species, (*speciossissimus*,) with flowers of the color of crimson-velvet; it is said to be still more superb than the grandiflorus; this genus belongs to a natural order, *Succulentæ*, or juicy plants; they are in general destitute of leaves, but the stems often appear like a series of thick, fleshy leaves, one growing from the top of another. The different species of this genus are distinguished by a diversity of common names; when they are of a *round* form, they are called *Melon thistles;* when more cylindrical and erect, *Torch thistles*; when creeping with lateral roots, *cereuses*; and when composed of a stem resembling flattened leaves, *Prickly pears.*

PRUNUS is the genus which contains the various kinds of the plum, cherry and sloe: this genus, according to ancient writers, was brought from Syria into Greece, and from thence into Italy. The Roman poets often notice its fruit. We have several native species of it.

The pomegranate, (PUNICA,) is a shrubby tree, which is a

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* Darlington.

† *Calyx*, genitive in Latin *Calycis.*

Calycandria—Genus Cactus—Different species distinguished by a diversity of common names—Prunus—Pomegranate.

native of Spain, Italy, and Barbary, and flowers from June till September. The Greek writers were acquainted with it, and we are told by Pliny, that its fruit was sold in the neighborhood of Carthage. It is cultivated in England and in the United States; not on account of its fruit, which does not come to perfection so far to the north, but as its large and beautiful scarlet flowers render it an ornamental plant.

The genus AMYGDALUS contains the peach and the almond. The latter is a native of warm countries, and seems to have been known in the remotest times of antiquity.

DI-PENTAGYNIA.

The four orders in the class Icosandria, which follow the first, are included under one, called Di-petagynia, signifying two and five pistils. We find in this order the hawthorn, (Cratægus,) a shrub with deep green foliage, white flowers and scarlet berries, and with very large and strong thorns.

The genus Pyrus which contains the apple and pear, belongs to the natural order Pomaceæ.* The *varieties* of these fruits are the effect of cultivation, not the produce of different species. By means of grafting or inoculation, which consists in inserting the bud of one tree into another, good fruit may be produced upon a tree which before produced a poorer kind.

Linnæus' natural order *Pomaceæ* is included by Jussieu in his family *Rosaceæ*, having rosaceous corollas. This family is divided into sections; as the *Pomaceæ*, having its fruit fleshy like the apple and pear; the *Rosæ*, having urn form calyxes; *Amygdalæ*, having drupe like fruits, &c.

POLYGYNIA.

In the 13th order we find the Rose; this, in its natural state contains but five petals; it is remarkable for the change of its stamens to petals by cultivation. Several species of the Rose are indigenous to North America; as the small wild rose, the sweet briar, and swamp rose. *Red* and *white roses* are remarkable in English history as emblems of the houses of *York* and *Lancaster;* for when those families contended for the crown, in the reign of Henry the sixth, the white rose distinguished the partizans of the house of York, and the red those of Lancaster. Among the nations of the east, particularly in Persia, the rose

* So called from Pomum, an apple.

Amygdalus — Order Di-Pentandria — Hawthorn — Pyrus, varieties by grafting—Family Rosaceae divided into sections—Order Polygnia—Rose.

flourishes in great beauty and is highly valued. The Persians poetically imagine a peculiar symphathy between the rose and the nightingale.

The Blackberry (Rubus) has a flower resembling the rose in general aspect ; there are several species of the Rubus, one which produces the common blackberry, another the red-raspberry, another the black-raspberry, and another the dewberry. One species of the Rubus produces large and beautiful deep red flowers, the fruit of which is dry and not eatable.

The Strawberry belongs to the same natural and artificial order as the Rose. The gathering of strawberries in the fields, is among the rural enjoyments of children, which are in after life, recollected with pleasure, not unfrequently mingled with melancholy reflections, upon the contrast of that happy season, with the sorrows, with which maturer years are shaded.

The fruit of the strawberry, as was remarked in the classification of fruits is not really a *berry* but a collection of seeds, imbeded in a fleshy receptacle.

Icosandria furnishes us with a great variety of fine fruits, more perhaps than any other of the artificial classes. A great proportion of the genera to be found in this class, are natives of the United States.

LECTURE XXXI.

CLASS XII—POLYANDRIA.

In this class we find the stamens separate from the calyx, and attached to the receptacle or top of the flower stem. The number of stamens in this class varies from twenty to some hundreds. This class does not, like the one we have last examined, contain a great many delicious fruits, but rather abounds in poisonous and active vegetables. The mode of the insertion of the stamens is to be regarded in considering the wholesome qualities of plants; it is asserted that no plant with the stamens on the calyx is poisonous; we know that very many with the stamens upon the receptacle are so.

In the analysis of the Poppy we have already examined the peculiar characteristics of this class.

Blackberry—Strawberry—Not really a berry—This class furnishes many kinds of fruit.—Class Polyandria—General character.

MONOGYNIA.

We find in the first order some flowers of a curious appearance, as the Mandrake, (Podophyllum ;) the distinction between this and the mandrake of the ancients, was remarked under the class Pentandria.

This plant is very common in moist, shady places, where you may often see great quantities of it growing together ; each stem supports a large white flower and two large peltate, palmate leaves; its yellow fruit is eaten by many as a delicacy.

The Side-saddle flower (Sarracenia) is a very curious and elegant plant ; it has large leaves proceeding directly from the root. These leaves form a kind of cup, capable of containing a gill or more of water, with which liquid they are usually filled. The stem is of that kind called a scape, growing to the height of one or two feet, bearing a single large purple flower. This plant is found in swamps ; its common name, Side-saddle flower, is given in reference to the form of its leaf. It is sometimes called Adam's cup, in reference to the shape of the leaf.

The name of the genus SARRACENIA, is derived from an imaginary resemblance of the flower, to the head of a Saracen or Turk enveloped in his crimson turban. No foreign plant as an object of curiosity, can exceed this native of our own swamps; it is well worth the trouble of cultivation by those who are fond of collecting rare plants.

The White Pond Lily, (Nymphæa,*) is a splendid American plant, very fragrant and with a larger leaf than almost any other northern plant. This flower closes at evening and sinks under the water ; at the return of day its blossoms expand and rise above the surface.

The Yellow Pond Lily, (Nuphar,) though less showy, is equally curious in its structure.

In this artificial class and order is the Tea tree, (THEA) ; of this plant there are two species, the bohea tea (*bohea*) and the green tea (*viridis*). It is a small ever green tree or shrub, much branched and covered with a rough, dark coloured bark. The, flowers are white, the leaves are lanceolate and veined, the capsule or seed vessel is three celled, opening, the seeds are three. oblong and brown. This shrub is a native of China and Japan.

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*An extensive locality of this plant exists upon the Saratoga lake. I have seen its surface for a quarter of a mile whitened by these lilies, occasionally intermixed with the yellow lilies, and the rich blue of the Pontederia, another beautiful aquatic plant.

Order Monogynia—Podophyllum—Sarracenia—Pond lily—Amphibious —Tea-tree—

Some suppose, that in reality, all the teas are taken from the same botanical species, and that the different flavour and appearance of them depend upon the nature of the soil, and culture, and the method of preparing the leaves.

On account of the secret and jealous policy of the Chinese, the natural history of the Tea plant is less known than might be expected from its very general use. The Chinese begin in February to gather the tea leaves, when they are young and yet unexpanded. The second collection is made in April, and the third in June. The first gathering which consists only of the young and tender leaves, is the *Imperial tea:* the other two kinds are less odorous; the last collected is the coarsest and cheapest kind. Tea was introduced into Europe by the Dutch East India Company, in the year 1666, when it sold for sixty shillings a pound, and for many years its great price limited its use to the most wealthy. In considering the effects of tea upon the human system, medical writers differ in opinion, and a doubt seems to remain whether the use of it is on the whole beneficial or injurious to the health of mankind. If it is not injurious to health, the use of it no doubt promotes the happiness of society, as it is exhilarating, and adds to the enjoyment of social intercourse.

The Poppy (Papaver) was one of the flowers early given you for analysis. Its numerous stamens standing upon the receptacle around the base of the germ, and its large stigma, with its two leaved caducous calyx must be well remembered. Single poppies have but four petals; but the change of stamens to petals is very common in this flower, and most of the cultivated poppies are double.

From the papaver somniferum, is obtained the opium of commerce. The juice which issues from incisions in the green capsules, is dried in the sun and usually made into cakes. Six hundred thousand pounds of this drug are said to be annually exported from the banks of the Ganges. The narcotic property of opium renders it highly valuable as a medicine. Why it is, that certain substances, acting upon the human system, have power to affect the mind, no physiologist has yet been able to explain. But in the power of fermented liquors to produce changes in the mind, or of opium to lull its faculties into temporary oblivion, there is nothing more wonderful, than that the presence of light should produce vision, or the vibrations of the air sound. All are equally beyond our knowledge; we may trace a series of organic changes, but the last link of the chain, that which connects body and soul, is concealed from our observation. Thus why it

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Poppy described—Opium as an article of commerce—Valuable as a medicine—Vast exports of it from the banks of the Ganges.

is we know not, but the fact is evident, that narcotics can for a time,

> "Raze out the written troubles of the brain
> And with a sweet oblivious antidote,
> Cleanse the full bosom of that perilous stuff,
> Which weighs upon the heart."

Yet but for a time does this effect remain; and they who would drown sorrow by artificial means, whether of the intoxicating bowl or the stupifying opium find their sensibilities return with aggravated terrors.

When properly used to allay bodily anguish, the product of the poppy may be conidered one of our greatest blessings; but like all our blessings it may, by our own misconduct, be made a curse.

The genus *Citrus*, which contains the orange and lemon is found here. Jussieu places this in his 70th order *Aurantia* or golden fruits. The fruit is a berry with a thick coat. It furnishes *citric acid*.

Few valuable fruits with the exception of this genus are found in the class Polyandria.

DI-PENTAGYNIA.

The four orders following Monogynia, are, as in the preceding class, united into one, called as before, Di-pentagynia, having from two to five styles.

We find here some plants of a poisonous nature, as the Larkspur, Monk's-hood, and the Columbine: these belong to a natural order called *Multisiliquæ*, or many pods, there being many pod-form capsules to each flower.

In the same order we find the Peony, (Pæonia,) a showy flower which when in its native state, has a 5 leaved calyx, a corolla with 5 petals, and 2 or 3 germs, each crowned by a stigma; the capsules the same in number as the germs, each contains several seeds; this flower is particularly remarkable for its change by cultivation.

POLYGYNIA.

The *Thirteenth Order* is divided into two sections. 1st, flowers with no calyx or perianth. 2d, with a perianth. In the first section we find several interesting native plants. The Clematis

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Power of opium and fermented liquors to affect the mind—Genus Citrus—Order Aurantia—Citric acid—Order Di-Pentagynia—Natural order Multisilliqueae—Peony—Order Polygynia—Divided into two sections—Clematis.

or Virgin's bower, is a beautiful climbing plant, which supports itself by winding its petioles or leaf-bearing stems around other plants: the flowers are white and clustered in corymbs; the seed has a long silk-like fringe which gives it a fine appearance after the blossoms have faded. This plant contains many species, and is cultivated both in this country and in Europe.

The Anemone is a beautiful native flower; by cultivation its petals multiply as in the Rose.

The Ranunculus contains many species: it belongs to the same natural family as the Anemone; but as you will find these plants very common, and are now able to analyze them, we will not at this time devote attention to them.

The Hellebore, (*Helleborus*,) is an exotic much spoken of by classical writers. Hippocrates one of the most ancient physicians remarks upon its qualities: it grew about Mount Olympus, and was regarded as a very poisonous plant.

The Magnolia* and Tulip tree are among the most splendid trees of North America; they are said also to be common to China. The Magnolia grandiflora extends from South Carolina to the isthmus of Darien. In some cases these trees rise to the height of 90 feet before sending off any considerable branches; the spreading top is then clothed with deep green oblong, oval leaves like a Laurel; these are at most seasons enlivened by large and fragrant white flowers.

The class Polyandria, though not important for its fruits, contains some valuable medicinal plants, besides opium and tea which we have noticed.

LECTURE XXXII.

CLASS XIII—DIDYNAMIA, AND XIV—TETRADYNAMIA.

The two classes which are to afford subjects for our present observations, are founded upon the number and *relative length* of the stamens.

In distinguishing their orders the number of styles is not regarded, but new circumstances of distinction are introduced, viz: the seeds being enclosed in a capsule, or destitute of any such covering; and the comparative length of pods.

* Named in honour of Magnol, a distinguished botanist.

Anemone—Ranunculus—Hellebore—Magnolia.
The two classes now to be considered—on what founded—Orders how distinguished.

CLASS DIDYNAMIA.

This class has flowers with four stamens, two of which are longer than the other two; plants of this class are in general easily distinguished; the stamens stand in pairs; the outer pair being longer, the inner pair shorter, and converging.

The class contains two orders, Gymnospermia, (naked seeds,) and Angiospermia, (seeds covered).

GYMNOSPERMIA.

In the 1*st order*, which contains plants with four naked seeds, the flowers grow in *whorls* or rings, having a square or angled stem, and leaves opposite. The corollas are *labiate*, having divisions resembling lips, and they are also called *ringent*, or gaping, because the lips appear to be open. The calyx is either in five equal parts, or consists of two lips.

The plants of this order are mostly aromatic; very few are poisonous. We find here the Mint, Lavender, Penny-royal, Savory, Balm, and others of a similar nature. They are included under the natural order of Linnæus, called *Verticillatæ*,* and the 39th order of Jussieu, *Labiatæ*. For more particular remarks upon these plants, you can consult remarks on the Labiate flowers.

ANGIOSPERMIA.

The 2*d order* contains those plants which have their seed covered, or in a capsule; the seeds are numerous. Plants of this order appear to have an affinity with some families of the class Pentandria. Many have in addition to the four stamens, a fifth filament, which appears to be the rudiment of another stamen; sometimes the irregular corolla varies into a regular form with five divisions. Among those which exhibit the imperfect fifth stamen, are the Trumpet-flower, Foxglove, and Penstemon.

In this order the *personate* corollas are to be found, or such labiate flowers as have closed lips. It should be observed that not all the flowers found here are labiate; some few may be found with bell-form and funnel-form corollas. Plants of this order differ much in their natural characters, from those of the order, Angiospermia. None of them are used in preparations for food, as are the Thyme and Savory of the first order, but many of them possess powerful medicinal properties; as the *foxglove*, (*Digitalis*,) and the cancer root; (*Epiphegus*.) They are in general a beautiful collection of plants; few flowers are more splendid than the Gerardia and the Trumpet-flower. These flowers are found in the natural order *personatae*, of Linnæus.

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* From *verticillus*, a whorl.

Class Didynamia—Two orders—Order Gymnospermia—Order Angiospermia.

As plants of this class are numerous in every part of the United States, you will have no difficulty in procuring them for analysis; they are not usually found in blossom until the middle of summer.

CLASS XIV—TETRADYNAMIA.

In this class we find the *cruciform* plants, or such as have four petals in the form of a cross; the stamens are six, four of which are longer than the remaining two; the calyx has four leaves. The orders in this class are two, depending on the comparative length of the pods; this distinction is not so definite as that which marks the orders of the class Didynamia. Plants of this class are not poisonous; many of them furnish us with useful food.

SILICULOSA.

The *First Order* contains plants which produce a short and round pod; a distinction in this order is made between such plants as have pods with a notch at the top, and such as have none, or are *entire*.

The pepper grass, (Lepidium,) and the shepherd's purse, (Thlaspi,) afford examples of this order. These and the remaining plants found here, belong to the natural order *Siliquosæ*, or such as have silique pods, the properties of which are nutritious and medicinal.

SILIQUOSA.

The *Second Order* contains such plants as have long and narrow pods; as the radish and mustard. The cabbage, (Brassica,) is an exotic; it contains the turnip species. These belong to the same natural family of plants as the first order. The whole are included under the 63d order of Jussieu, the *Crucifera*. This order is in Jussieu's 13th class, having seeds *dicotyledonous*, corollas *polypetalous*, and stamens *hypogynous*.

In this lecture we have pointed out to you the most important characters of the two classes, which depend upon consid-

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Class Tetradynamia—General character—Order Siliculosa—Order Siliquosa—Recapitulation.

erations derived from the number and comparative length of the stamens; the one class having four and the other six stamens of varying lengths. Both classes we found to have two orders, not as in the preceding classes, depending upon the styles; but in the one class, on the situation of the seed as lying in the calyx, or enclosed in a seed vessel; in the other class, from the comparative length of the pericarp or pod.

LECTURE XXXIII.

CLASS XV—MONADELPHIA.

We are now to consider the *brotherhoods*, as the names of the 15th classes signify; Monadelphia meaning one, and Diadelphia two brotherhoods, in allusion to the manner in which the filaments are connected in *one* or *two sets*. The orders in this class are arranged according to the number of stamens; a character which distinguishes the first ten classes: but no confusion arises from taking the same character in these classes to distinguish the orders, since in the classes themselves the number of stamens is not reckoned as a mark of distinction.

CLASS MONADELPHIA.

In this class we include all such plants as have their filaments united in one set, forming a tube at the bottom of the corolla. In this union of stamens, this class differs from all the preceding ones; for in those we found the stamens entirely separate; in this, you will observe that the *anthers* are separate, although the *filaments* are joined. We cannot in this class, as in the two preceding ones, point out any prevailing form of the corolla; the mark of distinction here is in some cases rather doubtful, the filaments being sometimes broad at their base, and yet, not entirely connected.

You will recollect that the orders here, depend upon the number of stamens. We have no first order here, for the character of the class is *united filaments*, and one filament or stamen could not possess this requisite of union.

The *Third Order* is the first which occurs; this is called *Triandria*, which you know is the name of the third class, and signifies three stamens. But here are three stamens united by their filaments into a tube. We find in this order a handsome

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General character of the classes—Monadelphia and Diadelphia—Class Monadelphia, character of the class—Orders—Order Triandria.

plant, called blue-eyed grass, (*sisyrinchium*;) the three filaments have the appearance of being but one; the corolla is tubular and 6 cleft, style 1, capsule 3 celled; it belongs to the family of sword-leaved plants, Ensatæ. This order contains the tamarind.

PENTANDRIA.

The *Fifth Order*, or five stamens, next occurs; this presents us with the passion-flower, (Passiflora,) a climbing plant, peculiar to the warm countries of America. "Its immensely long, and often woody branches, attain the summits of the loftiest trees, or trail upon the ground adorned with perennially green, or falling leaves, sometimes palmate, or lobed like fingers, at others appearing like the laurel. They sustain themselves by means of undivided tendrils; and send out a succession of the most curious and splendid flowers, of which no other part of the world offers any counterpart."*

Of this genus a number of species produce fruits of great excellence; this fruit in South America is called Purchas. Sixty species of this genus are collected at the Linnæan garden near New York.†

The generic characters of the passion-flower are a 5 parted, coloured calyx, 5 petals inserted upon the calyx, 5 stamens and 3 pistils, the nectary, a triple crown of filaments. The very singular appearance of this flower in the arrangement of its stamens in the form of a cross, and its triple crown, has suggested the idea of its being emblematic of the passion or suffering of our Saviour; this idea is supposed to have given rise to its name.

This plant was at one time placed in the class Gynandria, upon the supposition that its stamens stood upon the pistil. An English botanist‡ thinks it should be placed in the class Pentandria, and order Trigynia. Its situation in the class and order under which we have described it, is however that generally assigned it by American botanists.

In this order is also placed the stork's bill geranium, (Erodium,) it is an exotic, and belongs to the natural family *Geraniæ*.

* Nuttall.

† See Prince's Horticulture.

‡ Smith.

Order Pentandria,—Passion flower—different species—Generic character and name—Stork's-bill geranium.

HEPTANDRIA.

The *Seventh Order* contains the genus Pelargonium, which also belongs to the family Geraniæ; this genus includes the greater number of green-house Geraniums; it is taken from the tenth order and placed here, because, although its flowers have 10 filaments, but 7 of them bear anthers; therefore they have but 7 perfect stamens. The flower of this genus is somewhat irregular. Among the varieties of the Pelargonium now cultivated in the United States, are,

The *Fairy queen geranium*, with striped flowers, large and handsome leaves.

The *Fiery flowered*, with cordate leaves, and black and scarlet flowers.

The *Balm scented*, with leaves deeply five lobed, the flowers dark red and black.

The *Grandiflorum*, has an erect stem, little branched, with smooth leaves from five to seven lobed; as its name implies, the flowers are large.

The *Large bracted*, has an erect stem; leaves cordate or heart-shaped, flowers large and white, with some streaks of purple.

Frequent flawering, or *fish*, a shrubby, brown stem, with flat, cordate, five lobed leaves, and red flowers, with spots of black and deep red.

Peppermint scented or *Velvet leaved*, a shrubby stem, much branched; leaves cordate, five lobed, soft to the touch like velvet, flowers small, white, and purple.

Nutmeg scented or fragrant, an erect stem much branched, leaves small, cordate and three lobed, flowers small and pale, tinged with blue.

Royal purple, stem branched; flat cordate leaves, five lobed; flowers large and of a bright purple.

Another genus of the Geranium family is callad Hoarea—this contains several varieties, differing chiefly from the Pelargonium, in having a tuberous root, with *radical* leaves; most of the species are yellow. The plants of the natural family Geraniæ are mostly natives of the Cape of Good Hope, a region to which we are indebted for many of our finest exotics.*

DECANDRIA.

The *Tenth Order* contains the genus *Geranium* which differs from the Pelargonium, in having a regular calyx and corolla, and also in producing 10 perfect stamens, which vary in length, every alternate one being longer; 5 glands adhere to the base of the five long filaments. We have some native species of this genus; the common Crâne's bill (Geranium *maculatum*,) with large, showy, purple flowers, is often found in meadows during the first summer months.

The three families Erodium, Pelargonium, and Geranium, were formerly all united in one genus; but the difference in the number of stamens seems decidedly to separate them.

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* This description of geraniums is mostly taken from a work on Horticulture, by the proprietor of the Linnæan garden at Flushing.

Order Heptandria—Pelargonium—Family of the geraniums—Order Decandria.

POLYANDRIA.

The *Thirteenth Order*, (many stamens) is made up entirely of a group of genera which compose the natural order COLUMNIFERÆ, of Linnæus; the stamens are united in the form of a *column;* by Jussieu they have been collected into an order, under the name of Malvaceæ, so called from the genus *Malva.* The peculiar characteristics of the whole group are, a calyx often double, 5 regular petals, stamens numerous, united by their filaments into a tube, and rising like a column in the centre of the flower; in the centre of this tube are the styles, forming an inner bundle; the number of these is various, though often found to be eight. The number of seed vessels, each of which contains one seed, equals the number of styles; the seeds stand round in a circle.

Among the plants which compose this family, are the hollyhock, the mallows, and the cotton, (*Gossypium.*) The CAMELLIA *japonica*, or Japan rose, a very splendid flower equal in size to the largest rose, is found here. Its beauty of form and richness of coloring have a fine appearance, when contrasted with its dark green leaves.

Most of the native species of the class Monadelphia may, in the season of flowers, be easily procured for analysis. The hollyhock is in almost every garden, the common mallows grows wild about dwellings. You will find it a good example of the class Monadelphia.

The plants of this class vary in size from the low mallows to some of the largest trees that have yet been discovered; "the Silk cotton tree, (BOMBAX *pentandrum*,) is so large, and spreads its branches so widely that twenty thousand persons might stand under its branches. This tree is a native of Africa and South America. The Adansonia, a native of Senegal in Africa, is said to grow to the size of seventy feet in circumference; this tree also attains great age. In 1749, the learned Adanson saw two of these trees in the neighborhood of Gorrea, upon one of which was inscribed the date of the fourteenth, and upon the other that of the fifteenth century! yet there were good reasons to suppose that the trees were not young when the dates were cut. It may be conjectured that they have sometimes attained to the age of eight or nine hundred years! an immense period of time for the existence of any species of organized bodies."*

Having now considered the class Monadelphia in its most important particulars, we will pass to the next class, which in common with this, is founded upon the union of the filaments.

* B. S. Barton.

Order Polyandria—Natural order Columniferæ—Plants which compose this family—Plants of this character variable in size—Adansonia.

LECTURE XXXIV.

CLASS XVI—DIADELPHIA.

THIS is the class of two brotherhoods, the stamens being united by their filaments into two sets. The flowers of this class have already been described under the head of *Papilionaceous*, which you will recollect means butterfly shaped; this peculiar form of their corollas is an important mark of distinction in this class.

There are, however, two circumstances to be noted here, in order to prevent you from falling into error with respect to this class.

1st. There are some plants here which have their filaments united in one set; where a flower is papilionaceous, it is still kept in this class although there may be no apparent division in the brotherhood or set.

2nd. Although the flower be papilionaceous, and has ten separate stamens, it is placed in the 10th class; this is the case with a few genera; as the cassia and wild indigo. This circumstance was remarked under the tenth class.

The distinction of the filaments into sets is often somewhat difficult to be ascertained; in the pea for example, it is necessary to take a pin, and separate the filament which is alone, in order to perceive that it is not united to the other nine filaments. When they are separated, it is mostly in this way, with nine filaments together, and one which seems disconnected; there are but few examples of stamens being arranged in equal sets of five each.

, The nature of the fruit in the papilionaceous plants is leguminous, or bearing a pod, like the bean and pea, called a *legume.*

The orders in this, as in the preceding class, are founded upon the number of stamens, the class not having appropriated to itself a character drawn from the same circumstance.

PENT-OCTANDRIA.

We could not expect from the character of the class, "stamens united into two sets," to find any plants with but 1 stamen; therefore there is no order until we find some plants which answer the classic character. Those with five or eight stamens are all placed in one order called Pent-octandria, (five and eight

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Class Diadelphia—Two circumstances to be noted—Flowers Papilionaceous—Fruit leguminous—Order Pent-Octandria.

stamens;) here we find Corydalis and Fumaria, belonging to a natural order Corydales, which includes such plants as are spurred, or are anomalous; the latter term signifying that their corolla is not such as can be described by any thing else. The Corydalis is an elegant plant with bulbous roots; the corolla is rather ringent than papilionaceous. In some cases the stamens have very broad bases, and scarcely seem united.

We find here Polygala, one species of which is called Seneca snake-root; this not only produces a beautiful flower, but is valuable as a medicine. We have many species of this genus, and you will no doubt be able to find specimens of it in the woods and meadows.

DECANDRIA.

The *Tenth Order* is wholly composed of plants with leguminous pods; the general character of these plants is a calyx often 5 parted, corolla 5 petalled, inserted on the calyx, consisting of a banner, two wings and a keel; stamens generally 10, mostly united into two sets, 9 and 1, germ free, style 1, legume generally 2 valved, 1 celled, sometimes transversely divided into many cells, seeds affixed to the edge on one side.

In this large family of plants with leguminous pods are many of great importance in the vegetable kingdom; but when we are able to give some general natural characters, there seems to be less need of particularizing each genus.

This circumstance of being able in description, to include the general characters of the plants of a large order in this class, shows it to be composed of an assemblage of natural plants. The singular form of the corolla and the nature of the fruit, with few exceptions, settle the character of this class. We have here many important plants which serve for food to man. The most savage nations usually pay some attention to Diadelphous plants. When Ferdinand de Soto, marched his army into Florida, before the middle of the 16th century, he found the granaries of the natives well stored with Indian corn and certain "*leguminous seeds;*" which were probably the Lima bean, (Dolichos,) or some species of that genus; for the natives still continue to cultivate them.

This class furnishes valuable medicinal articles; as the liquorice and snake-root. It also furnishes us with plants for dying; as the Indigo, (Indicofera *tinctoria*,) this is to be distinguished from the Wild Indigo, (Baptisia,) which during the revolutionary war was used for coloring. Some plants of this

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Natural order Corydales—Polygala—Order Decandria—General character of the order—Contains many valuable plants.

class seem to possess active properties; the seeds of the Lupine are said to be poisonous. A traveller states, that the inhabitants of the banks of the Nile, are often visited in the night by the hippopotamus or river horse, a large animal which does great damage to the gardens and fields; and that they destroy the animal by placing a quantity of the Lupine seeds near where he is expected; these he devours greedily; they soon swell his stomach and distend it so much as to cause death.

The Furze (Ulex *Europæus*) is a very common plant in Europe, though not found so far north as Sweden. It is a flower of beautiful appearance; so much so that Linnæus (as is said) when he first beheld it fell upon his knees, in a transport of gratitude, and thanked the Author of Nature for thus beautifying the earth.

A class called Polydelphia, or many brotherhoods, having stamens united in more than two sets, was formerly admitted? but it was thought to be unnecessary, and the genera which it contained have been transferred to the class Polyandria; the St. John's wort (Hypericum,) is among the plants which were in the rejected class; this has its numerous stamens in three clusters, not united by their filaments; but even all the species of the Hypericum are not thus divided into separate parcels of stamens. This distinction, as the character of a class, is very properly laid aside; and the plants which were in the former 18th class Polydelphia, (*many brotherhoods,*) are now placed in the 12th class Polyandria (*many stamens.*)

In the last two lectures, you will recollect we have treated of two classes distinguished by the union of their filaments. In one class, Monadelphia, the general character was that of filaments united in one set forming a tube; the orders of this class were founded on the number of stamens, and bore the same names as those classes which are founded on a similar circumstance in respect to the stamens. In this class, no particular form of the corolla was found to be general, unless we except the last order, in which the hollyhock flowers may serve as an example; having a double calyx of an unequal number of divisions, a corolla of five heart-shaped petals, united into one piece around the column, formed by the united filaments.

In the other class, Diadelphia, we found the marks of distinction to be,

1st. The union of the filaments into two sets,

2d. The butterfly-shaped corolla; and,

3d. The nature of the fruits; consisting of that kind of pod called a legume, and thus forming one great natural family of

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Class Polydelphia, formerly admitted.

Leguminous plants, which furnish many of the most delicious table vegetables; such as peas, beans, &c.

The orders of this class are founded on the same circumstance in respect to the stamens, which distinguishes those of the preceding class.

We make these recapitulations for you, because it is always important in the consideration of a subject, to have a few clear ideas before you leave it; this is better than a great many imperfect or confused ones. It would, therefore, be well in all your studies, when you have read upon a subject, to ask yourselves what are the main points to be remembered; and you will find the less important facts or ideas, by the natural suggestions of the mind, will readily cluster around the principal ones.

LECTURE XXXV.

CLASS XVII—SYNGENESIA.

We have now arrived at a class which contains a large portion of the vegetable tribes, particularly of those plants which blossom in the last summer months, and in autumn.

The term Syngenesia signifies a *union* of *anthers*; this circumstance, you can readily conceive, forms a difference between this class, and those which are distinguished by a union of filaments; in the one case, the tops of the stamens, or the anthers, are united, while the lower parts are separate; in the other case, the tops are separate while the filaments, or lower parts of the stamens are united.

The number of stamens in plants of this class is mostly 5, distinguished from the fifth class, not only by the union of the anthers, but by the compound character of the flowers; the latter circumstance is indeed the *essential character* of the class. In some cases, plants with five stamens, have their anthers united, but having no resemblance to others in the class Syngenesia, they are retained in the fifth class: the violet and impatiens are examples of this irregularity. This is an instance in which the artificial arrangement, is made to bend to natural resemblances.

The general characters of the compound flowers have already been exhibited to you, in connexion with some 'of the most important and distinct natural families. The analysis of the

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Recapitulation—Class syngenesia—Characters which distinguish it.—

daisy, which was illustrated by a dissected plant, must have impressed upon your minds the peculiarities which distinguish this from all other classes.

You will recollect that a compound flower is a collection of little flowers or florets, placed upon the same receptacle, and within one common calyx; add to this description the five stamens, with their anthers united, forming a little tube, and you have an idea of a syngenesious flower.

The Orders of the class syngenesia are distinguished by different circumstances than are noticed in any other class; they are founded on the situation of the several kinds of florets. We will, however, before explaining the orders, remind you of the distinction made in these florets.

1. *Perfect*, such as have both stamens and pistils.
2. *Barren*, or *staminate*, having only stamens.
3. *Fertile*, or *pistillate*, having only pistils.
4. *Neutral*, destitute of either stamens or pistils.

They are also distinguished into *ligulate*, having a flat strap-shaped corolla, and *tubular*, having a tubular corolla.

The five orders in this class, depend on the various situations of these different kinds of florets.

ÆQUALIS.

The *First Order* contains those compound flowers which have all the florets perfect; this order is divided into sections.

1st. Containing such as have *ligulate* florets; as the dandelion, lettuce, and vegetable-oyster.

2d. Florets *tubulous*, with flowers in a head; as the thistle, and false saffron, (*Carthamus.*)

3d. Florets *tubulous*, without rays; as, bone-set, or thoroughwort, (*Eupatorium.*)

You will find no difficulty in procuring for analysis, either dandelions or thistles; bone-set is also abundant; therefore, for farther investigation of this order we will refer you to the plants themselves, aided by the generic and specific descriptions provided to assist you in analyzing plants.

SUPERFLUA.

The *Second order* presents us with such compound flowers as have the florets of the disk *perfect*, and those of the ray only *pistillate*, each pistil producing a perfect seed. The term *superflua*

Orders, how distinguished?—Different kinds of florets—Order Æqualis, divided into three sections—Order Superflua.—

is used, because the pistils in the ray, being unaccompanied with stamens, are said to be unnecessary or superfluous.

This order is divided into two sections.

1st. Flowers *without rays*, or the ray florets indistinct; here we find the tansey, and the life-everlasting; of the latter there are many species.

The Artemisia, a genus which includes the wormwood and southern-wood, both exotics, has but few native species. The name Artemisia is often improperly given to an ornamental plant, which belongs to the genus Chrysanthemum. "The genus Artemisia, was named in honor of Artemis, the wife of *Mausolus*, whose monument was one of the wonders of the world, (hence our word Mausoleum.) Pliny observes that women have had, also, the glory of giving names to plants."*

The 2d section of the order superflua, includes such flowers as have flat or ligulate petals, arranged around the middle or disk of the flower; these are called rays. The receptacles in this section are naked, that is, the top of the stem is found, on removing the different parts of the blossom, to be smooth, without any hairs or down, such as you may see on the dandelion after the petals have fallen off. We here find the star-flower, (Aster,) a genus in which 120 species have already been discovered, more than 60 of which are natives of the United States. These are not often seen in blossom until June and July; they appear in flower until the approach of winter. Many of these flowers are highly beautiful; the different species present a great variety of rich and delicate coloring, from the dark blue, purple, and red, to a pale blue, a light violet and pink, and in many cases, a pure white. In some, the yellow prevails; sometimes they are variegated, and often the disk and ray are of different colors. After having once become familiar with the Aster genus, you will seldom fail to distinguish it; but it is often difficult to determine the species. If you meet with obstacles in this, you are not to consider your time as lost; every comparison, and mental research strengthens the mind, and the greater difficulties you overcome, the greater will be the advantage, in thus accustoming yourselves to nice comparisons, and close investigations.

The golden rod, (Solidago,) is a numerous genus; the different species are mostly yellow; in one section of these plants the flowers are arranged in one sided racemes, in another they form small and irregular clusters. This genus will afford you

* Thornton's British Flora.

Two sections—Artemesia—Aster—Advantages of overcoming difficulties in the analysis of plants—Golden rod.

the same opportunity of strengthening your mental faculties by overcoming difficulties; for its numerous species are in most cases so faintly distinguished, as to require some patience and application to trace out the specific differences.

The genus Chrysanthemum contains the common daisy, sometimes called ox-eye; it also includes many splendid foreign plants, mostly of Chinese origin. The mountain daisy, (Bellis,) is the flower which you were taught to analyze under the head of compound flowers.

FRUSTRANEA.

The *Third Order* has the disk florets perfect; those of the ray are neutral, having neither stamens nor styles, though an imperfect seed is sometimes seen at the base of the florets; the name *Frustranea* alludes to *this imperfect seed.* We find here the Sun-*flower*, (Helianthus;) this is a very good plant to examine, as the organs are large, and develope very clearly the peculiar character of the class Syngenesia.

In this order is the Centaurea *benedicta*, or blessed thistle, a native of Spain, which received its name on account of some extraordinary virtues which it was thought to possess, such as being a remedy for the plague with which warm countries are often afflicted; at present this plant is not much valued.

NECESSARIA.

The *Fourth Order* includes plants in which the rays only are fertile or pistillate, and the disk florets are barren or staminate. We find here the marygold, (Calendula.)

SEGREGATA.

The *Fifth Order* contains a few genera, with each floret having a calyx proper to itself, besides a common calyx including the whole of the florets which make up the flower; this may be called a doubly compound flower. The only plant of this order yet discovered in the United States is the elephant's-foot, (Elephantopus,) a low, hairy leaved plant; with purple, ligulate florets.

We have now completed a survey of the orders of the class Syngenesia; the plants which it contains are almost wholly referred to the natural order Compositæ or compound flowers; by Jussieu, they are subdivided into three orders.

Chrysanthemum—Order Frustranea–Sun-flower–Blessed thistle—Order Necessaria—Marygold –Order Segregata, Elephant's-foot—Plants of this class referred to the natural order Compositæ.

DIVISIONS OF COMPOUND FLOWERS BY JUSSIEU.

1st, with florets all ligulate and perfect, leaves alternate, having milky juice, corollas mostly yellow; this includes the dandelion and lettuce.

2d order includes all compound flowers with tubular corollas, with receptacles fleshy and chaffy, egret stiff and bristly, leaves often with harsh prickles, flowers in a head; this includes the thistle, burdock, and false saffron.

3d order includes such compound flowers as have their inflorescence clustered in a corymb; as the life-ever lasting, boneset, and aster.

The plants of the class Syngenesia, are in general easily recognized at the first glance; there is something about them besides their compound character which distinguishes them from all other plants. One botanist observes, that they have a kind of "weed-like appearance, notwithstanding the beauty of their colouring; the stems and leaves are often rough, and they seem to have been less completely reclaimed from their savage state, than most other plants, with the exception of the Cryptogamous class."*

Not many of the plants of this class are poisonous; it is remarked that milky plants are generally so, but those of this class are exceptions. The lettuce, however contains a narcotic principle, and opium may be made from it. The dandelion, the eupatorium, the chamomile, and wormwood, with many other plants of this class are valued for medicinal properties.

The Syngenesious plants are particularly abundant in our own country, and you will never find difficulty in procuring specimens.

If you commence botanical studies with the flowers of spring, nature gradually presents you with those that will be more difficult to investigate. This class, it has been before remarked, are chiefly in blossom in the latter part of the season. Being previously prepared by a knowledge of the general principles of classification, and observations of plants, you will no doubt derive pleasure from the study of the class Syngenesia; though were you to commence a course of botany with these plants, you would feel as if thrown amidst a chaos of facts, without any clue to their classification.

* Barton.

Jussieu's division of compound flowers—Plants of this class easily recognized—Many are valued for medicinal properties—Found in the latter part of the season.

LECTURE XXXVI.

CLASS XVIII—GYNANDRIA.

We shall now examine a class, in which an entirely new circumstance from any yet considered, is regarded as forming its essential character. This circumstance is the situation of the stamens upon the pistil, or the stamens appearing to grow out of that organ. In some cases the stamens appear to proceed from the germ, in others, from the style. There is sometimes difficulty in deciding as to the number of stamens, for they are not here, as in the other classes, distinct organs, but in some cases mere collections of glutinous pollen.

The orders in this class, as in Monadelphia and Diadelphia, depend on the number of stamens, or of those singular collections of pollen which are called stamens. The Orchis plants form an important part of the class Gynandria; most of these are perennial, and grow in moist and shady places; some of them are parasites, adhering to the bark of trees by their fleshy fibrous roots. The roots consist sometimes of two solid bulbs, in other cases they are oblong, fleshy substances, tapering towards the ends like the fingers of the hand. We find here the natural family Orchideæ, so called from the genus Orchis, a name derived from a Greek word, signifying an olive-berry, on account of the root being round like that fruit. The Orchis family is not, however, confined to this one genus, but includes the Arethusa and several other genera. The distinguishing characters of this natural family are a corolla above the germ, 5 petals, 3 external and 2 internal. There is also in each corolla a petal-like organ, called the lip, which varies in form and direction, anthers always 1 or 2, and from 1 to 4 celled, sessile, or sitting upon the side or apex of the style; the pollen is easily removed from the cells in glutinous masses; the styles are simple, with viscous stigmas of various forms and positions. The capsules are 1 celled, 3 valved, 3 keeled; seeds are numerous and dust-like, clasping the stem like the leaves of grasses. The stems or scapes are simple, undivided, and the flowers are arranged in spikes or racemes.

MONANDRIA.

The 1st order of the 18th class contains such plants as have but one stamen, or two masses of glutinous pollen, equal to one

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Class Gynandria—New circumstance to be regarded—Orders depend on the number of stamens—Natural family Orchideæ—Distinguishing characters of this family—Order Monandria.

stamen; this order is divided into sections, which relate to the manner in which the anther is attached to the style; as, whether it is easily separated, whether the anther grows upon the top of the stigma, and to the shape of the masses of pollen which are called the anther.

The Orchis genus, which is found in this order, has a nectary in the shape of a horn; its corolla is somewhat ringent, the upper petal vaulted, the lip is spreading, the 2 masses of pollen are concealed at the sides, by little sacs, or hooded hollows of the stigma.

DIANDRIA.

The 2d order contains the ladies' slipper, (Cypripedium,) the nectary or lip, is large, inflated, and fancied to resemble a slipper. We have several species of this curious plant, some of them are yellow, some white, and others purple.

PENTANDRIA.

The 5th order contains the milk-weed, (Asclepias,) which by some has been placed in the fifth class, on the supposition that the stamens did not proceed from the pistil. In order to assist you to understand these flowers, we will present you with a very plain and simple description, borrowed from a manuscript belonging to an American botanist,* who has devoted many years in attention to scientific pursuits, and has particularly examined into the character of the plants we are now considering. He says, "I select the milk-weed for exercising you in the Grammar of Fructification, because it will lead you into a very nice investigation of that kind of flower whose anthers produce glutinous pollen; and I now apprize you, that the stamens are generally obscure, and difficult to ascertain correctly, in such cases, particularly in the flowers of the Orchis tribe.

"Take one of those heads of flowers from the milk-weed, (Asclepias,) which are so common in the months of June and July, you will perceive that each flower grows upon a little stalk, and that all these stalks proceed from the same centre, like the braces of an umbrella; which answers to the definition given of an umbel inflorescence.

"The most conspicuous parts of a single flower, are five upright substances, and five petals reflexed and lying down close to the stem; lift up those petals, and you will find a calyx consisting of five small narrow leaves.

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* Professor Eaton.

Orchis—Order Diandria—Ladies'-slipper—Order Pentandria, Milk-weed—Eaton's description of the milk-weed.

"You will now have ascertained that the inflorescence is an umbel, that the calyx consists of five leaves, and the corolla of five reflexed petals.

"As the five upright substances, with a little horn in the centre of each, have not the appearance of stamens, although they are next in course to the petals, you may at first be at a loss what to call them; but I will here give you Linnæus' name, for every thing, whether inside or outside of the corolla, if it be neither calyx, stamen nor pistil, of whatever form and size it may be; he having found that such parts generally secrete a sweet liquid, calls them all by the general name nectaries; such as the shoe part of the ladies' slipper, the spur of the nasturtion, &c. Now pull off all the nectaries, and examine the part which they encircled. You will observe five shelly projections between where the nectaries stood, between these are seeds lying very close, which you must peel off carefully with a sharp pointed knife, so as not to disturb what is under them. You will probably find some difficulty in effecting this at the first trial, but you cannot proceed in your examination until it be accomplished.

"Next, examine what is left with your magnifying glass, though you may see the parts without a glass; you will discover a lobe hanging down from each side of the five shelly projections, resembling bees' wax in appearance; these are the anthers with glutinous pollen; as the two lobes hang to the branches of a single stamen, though very unlike stamens in other cases, they are properly the double anther of a single stamen. The thick substance from which the stamens proceed, is the stigma, consequently, the milk-weed is placed in this class, Gynandria; the *orders* in this class are distinguished like the preceding *classes*, consequently, the five stamens place it in the order Pentandria. The large, thick stigma has the appearance of a germ or pericarp; but if you pull off the stigma, you will discover two pericarps under it, of a different structure from that of the stigma; perhaps you will never meet with a stigma in any other flower, so large in proportion to its other parts as in the milk-weed. The anthers are pressed close to the side of the stigma by the valves or scales, and the glutinous pollen probably is absorbed by it; by which means the seed is fertilized, as in cases where the pollen is a dry powder. The manner in which either kind of pollen operates upon the stigma, is totally inexplicable; we know nothing more of the subject, than that no seed is ever perfected without it, in any species of vegetables."

No farther remarks on the character of this plant could be

Eaton's description of the Milk-weed.

of use, after the clear and plain description just given; you will have no difficulty in procuring specimens of this plant for analysis; a variety of species are in flower in June and July.

The Apocynum, or dogsbane, with some other genera, which were formerly placed in the 5th class, are now classed here.

HEXANDRIA.

The 6th order contains the Virginia snake-root, (ARISTOLOCHIA *serpentaria*,) a perennial plant, with brown fibrous roots; it is found in shady woods, from New England to Florida: the root is highly valued in medicine; it possesses an aromatic smell, somewhat similar to spruce. It is said to have been found, by a chemical analysis, to contain "pure camphor, a resin, a bitter extractive, and a strong essential oil."* It was used by the Indians as a remedy for the bite of a snake; from this circumstance is derived its name. This plant has medical properties unlike the POLYGÀLA *senega* or Seneca snake-root, and the mistaking one for the other, might, in critical stages of disease, be attended with fatal consequences.†

DECANDRIA.

In the 10th order, we find the wild ginger, (ASARUM;) this is a native plant, so low that its flowers are almost concealed in the ground; the roots are creeping and aromatic, having the taste and smell of the snake-root, (Aristolochia.)

We have now finished a review of the class Gynandria; although many species of it are native to this country, you will not so readily procure specimens of this as of most other native plants. The ladies'-slipper, milk-weed, and dog's-bane, you can often find, but many of the plants of this family, particularly the Orchis tribe, opposing all attempts at cultivation, are to be found only in the depths of the forest, or places little frequented by man; we may, in this respect, compare them to the aboriginal inhabitants of America, who seem to prefer their own native wilds to the refinements and luxuries of a civilized life.

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* Rafinesque's Medical Flora.

† A physician prescribed for an infant the Seneca snake-root, POLYGALA *senega*,) as a medicine in a case of extreme sickness; an ignorant apothecary sent in answer to the prescription, the Virginia snake-root, (ARISTOLOCHIA *serpentaria*.) The physician had fortunately remained to inspect the medicine which he had ordered, and the mistake was seasonably discovered; this instance shows the importance of botanical knowledge, particularly in those who attempt to deal in medicine; had the mother of the child understood botany, she might have discovered the mistake, had the physician not been present.

Order Hexandria—Virginia snake-root—Order Decandria—Wild-ginger—Many plants of this class cannot be cultivated.

LECTURE XXXVII.

CLASS XIX—MONŒCIA, AND XX—DIŒCIA.

In all the classes hitherto examined, we have found perfect flowers, that is, those which presented the two important organs on which the artificial system is founded. In the first ten classes, we had only to count the stamens to determine the class, and the pistils to ascertain the order.

In the two next classes, we observed whether the stamens grew upon the calyx or the receptacle, and as before, counted the styles to ascertain the order.

In the two next classes, each having two orders, we were guided by the comparative length of the stamens, and certain appearances of the seeds, in one class, and of the seed vessel in the other.

We next found two classes, where connexion of stamens by means of filaments, was the essential character, and whose orders depended upon the number of stamens.

In the great class of compound flowers, we regarded chiefly the circumstance of united anthers; the orders being founded upon certain circumstances relative to the little flowers, (florets,) which compose the whole flower.

The class which was the subject of our last lecture, presented us with the stamens in a new situation; viz. growing out from the pistil, and the orders were reckoned according to the number of these strange looking stamens, each one of which in general is formed of two masses of glutinous pollen.

Our present inquiry is to be directed to two classes, in which the flowers are imperfect, or both stamen and pistil are not found in the same individual flower. The stamens are infertile and disappear without any fruit, the pistils contain the germ, and when fertilized by the pollen, produce the fruit.

CLASS MONŒCIA.

The class Monœcia, (one house,) contains plants, where, upon the same root, we find some flowers containing only stamens, others only pistils. The orders in this class are determined by the number of styles or pistils.

MONANDRIA.

In the first order is the Bread-fruit-tree, (ATROCARPUS,) which

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Recapitulation—Two classes to be considered—Class Monœcia, orders—Order Monandria—Bread-fruit.

grows to the height of forty feet; having fruit of an enormous size, hanging from its boughs like apples; it is a native of the East Indies, much valued for food.

TRIANDRIA.

In the 3d order we find a very common plant, called cattail, (Typha,) this grows in swampy meadows, and in stagnant waters, often to the height of four or five feet. The long, brown and hard spike which grows at the summit of the stem, (giving rise from its peculiar appearance to the name Cat-tail,) is the *catkin;* it contains in the upper part, the staminate flowers, having neither calyx nor corolla, the 3 stamens arising from a chaffy or hairy receptacle. The pistillate flowers forming the lower part of the spike, produce each a seed supported in a kind of bristle. This plant has sometimes been used for making beds, but is considered by physicians as unhealthy, on account of the the properties inherent in its vegetable substance.

The sedge or Carex, is a numerous genus, nearly 100 species have been discovered in North America. It is a grass-like plant, but separated from the family of grasses, which are mostly of the 3d class, on account of the monœcious character of its flowers. The study of this genus alone, might occupy years; a treatise upon it called Caricography,* has been lately published by an American botanist.†

The Indian corn, (Zea *mays*,) is found in this order. The top or panicle, consists of staminate flowers only, and of course never produces corn; the pistillate flowers grow in a spike, enclosed in a husk; each pistil produces a seed called corn, the pistils are very long, forming what is called silk.

TETRANDRIA.

The 4th order contains the Mulberry tree, (Morus,) of the same natural order as the nettle, having leaves rough, and flowers destitute of beauty.

PENTANDRIA.

The 5th order contains the genus Amaranthus, which is a very common weed, seeming to have some analogy to the pigweed; not only in natural properties, but in being dignified with a name which forms a somewhat ludicrous contrast with its mean appearance.

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* From Carex, *caricis.*

† Professor Dewey.

Order Triandria—Cat-tail—Sedge or Carex—Indian corn—Order Tetandria—Mulberry—Order Pentandria—Amaranthus.

This genus however, contains some elegant foreign species; one of which AMARANTHUS *melancholicus*, has received the whimsical name of Love-lies-bleeding; probably from the circumstance of its long, spiral, red flower stalks, bending over, often reclining upon the ground.

Another species called Prince's feather, is always erect. The Amaranth, whether from its being a good word to fall in with poetical measure, or from some fancied intrinsic beauty, has ever been a favourite with poets. Milton, when speaking of the multitude of angels assembled before the Deity, says,

————————"To the ground,
With solemn admiration, down they cast
Their crowns, inwove with Amaranth and gold;
Immortal Amaranth, a flower which once
In Paradise, fast by the tree of life,
Began to bloom, but soon for man's offence,
To Heaven removed.
With flow'rs that never fade, the spirits elect
Bind their resplendent locks, enwreathed with beams."

In Portugal, and other warm countries, the Globe Amaranth is said to be used for adorning the churches in the winter.

POLYANDRIA.

The 12th order contains the genus CALLA, of which we have some native species; it includes the elegant exotic, CALLA *ethiopica*, or Egyptian Lily. In this genus, the flowers having neither calyx nor corolla, grow upon that kind of receptacle which is called a spadix; the staminate and pistillate flowers are intermixed, the anthers have no filaments, but are sessile or fixed upon the receptacle; the berries are one celled, many seeded, and crowned with a short style. This spadix thus covered with the fructification, stands erect, surrounded by a spreading, ovate spatha; this, in the Egyptian Lily is of a pure white, presenting a very showy appearance. Without attention to the structure of the plant, you would probably suppose the spatha to be the corolla; the leaves are sagittate or arrow form.

The wild turnip or Indian turnip, (ARUM,) belongs to the same natural family as the Calla; the spatha in the Arum is sometimes green, streaked with brown, and dark purple, in some species it is inflected or bent inwards, covering the spadix.

The arrow head, (SAGITTARIA,) is unlike most of the Monœ-

Different species of the Amaranthus—Melancholicus, &c.—Order Polyandria—Genus Calla—Calla Ethiopica or Egyptian lily—Wild turnip—Arrow head.

cious plants in general appearance, it has a three leaved calyx and 3 white petals, not unlike the Spider's-wort in the form of its flowers. Many species of this very delicate looking plant in autumn may be found in ditches and stagnant waters.

We find in this order many of the most important forest trees, the oak, beech, walnut, chesnut, butternut, and birch. These trees all belong to one natural family, distinguished for bearing their staminate flowers in nodding aments, which are furnished with scales, on which the stamens are inserted; the pistillate flowers have scales or calyxes. The fruit is often hard, the stems are woody, and the roots are perennial.

MONADELPHIA.

The 15th order, in which the *filaments* are united in a column, presents us with the Cucumber tribe, (*Cucurbitaceæ;*) these include not only the proper CUCUMIS, which is an exotic, but some native genera of similar plants; we find here the gourd, squash, watermelon, and pumpkin. These plants have mostly a yellow, 5 cleft corolla, calyx 5 parted, 3 filaments united into a tube, a large berry-like fruit, called a Pepo; this, in the melon, is ribbed, and in the cucumber uneven and warty. We find in the same artificial order a very different family of plants, called *Coniferous*, or cone bearing plants; these have the staminate flowers in aments, each furnished with a scale or perianth supporting the stamens; the pistillate flowers are in strobilums, each furnished with a hard scale. The stems are woody, the leaves ever green, and the juice resinous. To this natural family belong the pine and cypress.

The character of trees may be studied to advantage at four different seasons: in winter, when the forms of the ramification can be seen in the naked boughs, and the leaf and flower buds examined in their inert state; in spring, when in blossom; in summer, when the foilage is in perfection; and in autumn, when, during the first stages of decay, the mellowness and variety of tints afford beautiful subjects for the pencil of the painter, and the investigation of those who love the study of nature under all her forms.

CLASS DIŒCIA.

The class Diœcia, (two houses,) has staminate and pistillate flowers on separate plants. The distinction with regard to the

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Forest trees—Order Monadelphia—Cucumber tribe—General character—Cone-bearing plants—Best periods for studying trees—Class Diœcia—Orders—

orders, as in the preceding class, is derived from the number of stamens.

There are no plants of the first order.

DIANDRIA.

The 2d *Order* contains the willow, (Salix,) which has long and slender aments, both of staminate and pistillate flowers, the two kinds being on separate trees.

The order Triandria contains the fig, (Ficus,) remarkable for containing the flower within the fruit, which is botanically considered as a juicy receptacle, within which are concealed the minute flowers and seeds. The fig is peculiar to warm countries.

Tetrandria contains a parasite plant, the *Misseltoe,*but one species is native to this country. The Druids considered this plant as sacred to the sylvan deities. Tradition relates, that where Druidism prevailed, the houses were decked with this plant, that the sylvan spirits might repair to them.

The order Pentandria of the class which we are now considering, contains the hemp, hop, and prickly-ash tree.

Hexandria, contains the honey-locust and green briar.

Octandria, has the poplar, (Populus,) similar in natural character to the willow. Several intermediate orders occur before we arrive at the 15th order, Monadelphia ; here we find the red cedar and the Yew, which belong to the cone bearing family, with the pine and cypress.

We have now completed our remarks upon two classes which have imperfect flowers. Our review of these has been brief, when compared to the many interesting facts which presented themselves in association, with the various important plants which we have passed in rapid succession ; but this very mass of interesting matter has compelled us to dwell less upon particular facts. We have now but one more class to investigate, in order to complete our view of the Linnæan system.

LECTURE XXXVIII.

CLASS XXI—CRYPTOGAMIA.

The twenty preceding classes include the Phenogamous plants;

Diandria—Willow——Order Triandria—Fig—Order Tetrandria—Misseltoe — Order Pentandria—Hemp Hop,&c—Order Octandia — Poplar— Order Monadelphia—Red Cedar, &c.—Class Cryptogamia.

the one we are now to consider is termed Cryptogamous,* a term which signifies that the stamens and pistils are concealed or invisible to the naked eye. These plants constitute the first class of Jussieu, called *acotyledonous ;* their seed being destitute of any cotyledon.

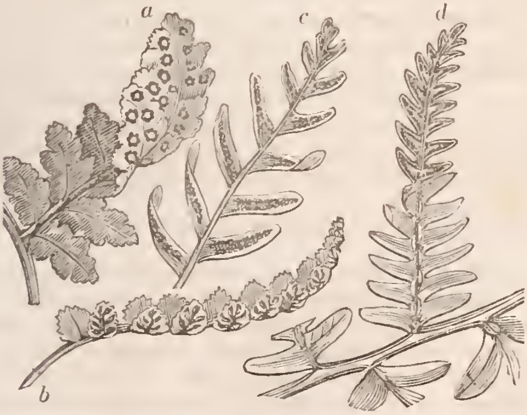
As we enter upon this last of the Linnæan classes, we shall find all our former principles of arrangement to fail us, and that we are, it might almost seem, entered upon a new science. The class Cryptogamia includes all plants which do not find a place in some of the other classes. Some writer has said, that Linnæus having arranged the plants which would admit of classification, took the remainder and cast them all into a heap together, which he called Cryptogamous; he did not, however, rest satisfied in thus throwing together the refuse of the vegetable world; but subdivided this miscellaneous collection into orders, or we might more properly say, that he gave names to those divisions already marked out by nature.

Of these orders, which are natural families brought together on account of general resemblances and analogies, without reference to any one principle, there are six.

Filices, *or* FERNS.

The 1st *order* contains the Ferns ; their plume-like leaves are called *fronds*. The fruit, mostly disposed in dots or lines, grows on the back, summit, or near the base of the leaf or *frond*. You may here see (*Fig.* 47.) a delineation of some of

Fig. 47.



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* Some French botanists consider that there are plants in reality destitute of stamens and pistils ; these they term *Agamous*.

Founded on new principles of arrangement—Orders marked out by nature—Ferns—Modes of the fructification of ferns.

the various modes in which the fructification of ferns appears; (*a*) genus POLYPODIUM or polypody with capsules in roundish spots on the back of the frond; (*b*) ASPLENIUM, capsules in lines nearly parallel, diverging from the centre of the frond; (*c*) BLECHNUM, capsules in uninterrupted lines running parallel to the midrib of the frond on both sides; (*d*) PTERIS or brake, capsules forming lines on the edge of the leaf.

Some ferns bear their fruit in a peculiar appendage, as a spike or protuberance in the axils, or at the base of the leaves; no appearance of flowers is ever presented. When the brown or white dust-like spots are examined with a microscope, they are found to consist of clusters of very small capsules, at first entire, but afterwards bursting elastically and irregularly. Besides attention to the situation and form of the capsules, it is necessary to observe the membrane which envelopes them; this is called their involucrum. The seed is as minute as the finest powder, and so light as to be wafted by the air to any distance or height; we thus often see ferns growing high on the trunks of trees, or on the summits of old buildings. Some ferns grow to a great height in southern latitudes, almost like trees. At the southern extremity of Van Dieman's Land, a species has been found, whose trunks attained to the height of twelve or sixteen feet. One species in our country, ONOCLEA *sensibilis*, called the sensitive fern, is said to wither on being touched by the human hand, though the touch of other substances does not produce any similar appearances.

The number of species of ferns which are already known, amounts to about seven hundred. They generally abound in moist and shady situations, but are sometimes found on rocks and dry places and on the trunks and branches of old trees. The frond or leaf of the fern is often *pinnate*, or divided like a feather; sometimes it is undivided and resembles a palm-leaf.

The EQUISETUM *hyemale* is known to house keepers under the name of *scouring rushes.* The quantity of silex contained in the cuticle renders it a good substitute for scouring sand.

Musci, *or* MOSSES.

The 2nd *order* contains the mosses, which are little herbs with distinct leaves, and often a distinct stem; their conical, membranous corolla is called a *calyptra* or veil, its summit being the stigma; this veil clothes the capsules, which before the seed ripens, is elevated on a fruit stalk. The capsule is of one cell, and one valve, opening by a vertical lid; the seeds are very

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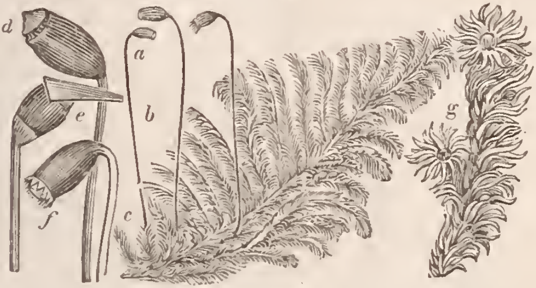
Sensitive fern—Number of species—Where they generally abound—Scouring-rushes—Mosses.—

numerous and minute. In some genera the veil is wanting, which serves as a distinction in the order. The barren flower of mosses consists of a number of nearly cylindrical, almost sessile anthers, the fertile flowers of one pistil, seldom more, accompanied by several barren pistils. Both stamens and pistils are intermixed with numerous succulent threads. You may here observe (*Fig.* 48,) the different parts of mosses; (*a*) represents the *capsule*; (*b*,) the *pedicel* or stem, (*c*,) the *sheath*, which before the pedicel grew up, served as a kind of calyx, to protect the embryo fruit; (*d*) the *operculum* or lid which before the capsule is ripe is covered by the calyptra; (*e*) the *calyptra*, or veil; *f*, the *fringe* or teeth which when the capsule is ripe, and has thrown off its other parts often appear around its edge; (*g*,) the barren or staminate flower of a moss.

Fig. 48.



The mosses are generally perennial and evergreen, and capable of growing in colder climates than most other vegetables. In Spitzbergen, the rocks which rise from the surrounding ice, are thickly clothed with moss. A botanist who travelled in Greenland, counted more than twenty different species without rising from a rock where he was seated. The parts of the mosses which have been described are not seen without the assistance of a good microscope. It is not to be expected that young botanists will be fond of this department of the science, although those who become acquainted with it, discover much enthusiasm in its pursuit. The following interesting remarks on Cryptogamous plants are taken from an English writer.

" Mosses and Ferns, by the inconsiderate mind, are deemed an useless or insignificant part of the creation. That they are not, is evident from this, that he who made them has formed nothing in vain, but on the contrary has pronounced all his

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The inconsiderate may think mosses and ferns an insignificant part of creation—Various uses—Different parts of mosses.—

creation to be *good*. Many of their uses we know; that they have many more which we know, not, is unquestionable, since there is probably no one thing in the universe, of which we can dare to assert, that we know all its uses. Thus much we are certain of with respect to mosses, that as they flourish most in winter, and at that time cover the ground with a beautiful green carpet, in many places which would otherwise be naked, and when little verdure is elsewhere to be seen; so at the same time they shelter and preserve the seeds, roots, germs and embryo plants of many vegetables, which would otherwise perish. They furnish materials for birds to build their nests with, they afford a warm winter's retreat for some quadrupeds, such as bears, dormice and the like, and for numberless insects which are the food of birds and fishes, and these again the food or delight of men. Many of them grow on rocks and barren places, and by rotting away, afford the first principles of vegetation to other plants, which never else could have taken root there. Others grow in bogs and marshes, and by continual increase and decay, fill up and convert them either into fertile pastures or into peat bogs, the source of inexhaustible fuel to the polar regions.

"They are applicable also to many domestic purposes. The *Lycopodiums* are some of them, used in the dyeing of yarn, and in medicine; the *Sphagnum*, (peat moss,) and *Polytrichum* furnish convenient beds for the Laplanders, and the *Hypnums* are used in the tiling of houses, stopping crevices in walls, packing brittle wares, and the roots of plants, for distant conveyance.

"To which may be added, that all in general, contribute entertainment and agreeable instruction to the contemplative mind of the naturalist, at a season when few other plants offer themselves to his view.

"The Fungi have been suspected by some to be, like sponges and corals, the habitations of some unknown living beings, and being alkaline, have been classed in the animal kingdom; but they are known to produce seeds, from which perfect plants have been raised; and the celebrated Hedwig by great dexterity of dissection, and by using microscopes of very highly magnifying powers, assures us, that he has discovered both stamens andpistils not only in this order of plants, but in the other orders of the Cryptogamous family."*

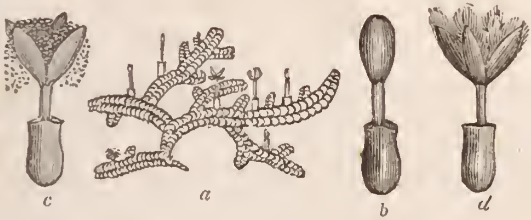
* Thornton's Botany.

Various uses of the mosses.

Hepaticæ or LIVERWORTS.

The 3d *order* contains the Liverworts, which are more succulent or juicy than the mosses; they have four valved capsules, which circumstance, and that of the capsule not opening with a lid distinguish them from the mosses. Their name, Hepaticæ, signifies liver; but it is not yet known whether they received that name on account of some supposed virtue in curing diseases of the liver, or whether it was because they were thought to resemble the lobes or divisions of the liver. One of the most common genera, of this order is the *Jungermannia;* you may here see (*Fig.* 49.) a species of this, the *complanata* with its parts as represented under a magnifier.

Fig. 49.



(*a*) A plant of natural size in fruit. (*b*) The fruit magnified, showing the sheath, the peduncle rising from it, and the capsule at top not yet burst. (*c*) The capsule splitting and discharging the seeds. (*d*) The capsule empty, showing its four valves.

Algæ, or SEA WEEDS.

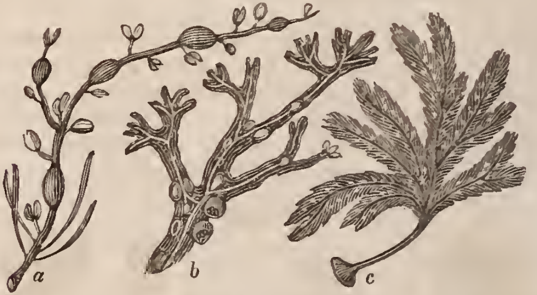
The 4th *order* includes the sea weeds and frog spittle; these have leathery fronds, with fine dust-like seed, enclosed in inflated portionsof the frond. They are almost always aquatics, generally green or reddish. One genus of this family is the *Fucus*, in the plural *Fuci;* these plants with some others of this order, swim on the waters of the ocean. The FUCUS *natars*, sometimes called the gulf-weed, is very abundant in the Gulf of Florida; and is found in various parts of the ocean, forming masses or floating fields, many miles in extent. The plant seems to possess no distinct root, though it perhaps originally vegetated on some sea-beaten shore from whence it was,

> "————Flung from the rock on Ocean's face to sail,
> Where'er the surge may sweep, the tempest's breath prevail."

Liverworts—Derivation of the name—Sea weeds—Fuci—Gulf weed.—

The Fucus *giganteus* is said to have a frond of immense length; from whence its specific name signifying gigantic. You are here presented (*Fig.* 50.) with a delineation of three kinds of *Fuci.* (*a*) Fucus *nodosus* (knobbed fucus) this has forked fronds. The knobs which appear in the fronds, are air-bladders, which render it peculiarly buoyant upon the water. This is often more than six feet long. (*b.*) Fucus *vesiculosus* (bladder fucus) here the air-bladders are mostly axillary, and at the sides of the mid-rib. It varies in length from one to four feet. On account of its mucilaginous property it forms a good manure; and in some of the countries of Lapland it is boiled with meal, and given for food to cattle. (*c*,) Fucus *serratus*, has a beautiful *serrate* or notched frond.

Fig. 50.



The Fuci, on burning, afford an impure soda called *Kelp.*

Lichenes—or LICHENS.

The 5*th order* contains the LICHENS; these are various in texture, form, and colour; they are leathery, woody, leaf-like, white, yellow, green, and black. When wet, they often appear like green herbage; some appear on stones or old fences and buildings; others with strong, green filaments, are suspended from branches of trees and improperly called mosses. The fruit of the lichen consists of tubercles, or saucer-like bodies in which the seeds are contained; this may be seen in the following delineation. (Fig. 51.) (*a*) represents a lichen of a leaf-like

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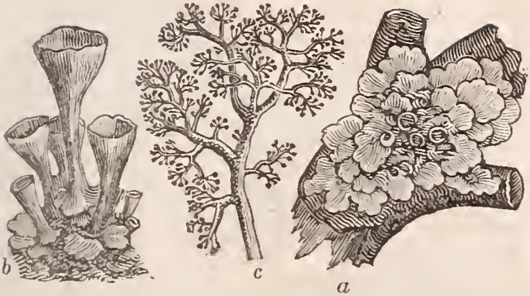
Delineation of three kinds of Fuci—Kelp—Lichens—Of what the fruit consists.

Fig. 51.



appearance; here the saucer-like bodies in which the seeds are imbedded are very apparent. (*b*) is a lichen resembling a drinking glass. (*c*) is the rein-deer moss, furnishing almost the sole food of that useful animal so important to the existence of the Laplander. In the middle of Europe it grows only to the height of two or three inches; but in Lapland it sometimes attains to the height of one foot and a half.

Many of the lichens are useful on account of their colouring matter. *Litmus*, which is so common as a chemical test for acid sand alkalies, is obtained from a species of white lichen,called *Orchal*, or *Archil* which is also used for giving a crimson color to wool and silk: and the powder called *cudbear* used for dying purple, is obtained from lichen. The order Lichen has sometimes been included under one genus called lichen, and placed the order *Algæ*.

Fungi, *or* MUSHROOMS.

The *6th order* contains the *Mushrooms;* these never exhibit any appearance of green herbage, they are generally corky, fleshy, or mould-like, varying much in form and colour. The fruit of some is external, of others internal. They are often of very quick growth and short duration, hence the expression which is often ironically made, a "character of mushroom growth," when a person has suddenly acquired consequence. The genus *Agaricus*, which contains the common eatable mushroom, has a convex, scaly, white head, called a *pileus*; this is supported on a stalk called a *stipe*. On the under surface of the pileus or cup, are seen many flesh-coloured membranes called *gills*. These gills in the young state of the mushroom, are concealed by a wrapper called a *volva*, which is considered as a kind of calyx. As the mushroom becomes older, the volva bursts and

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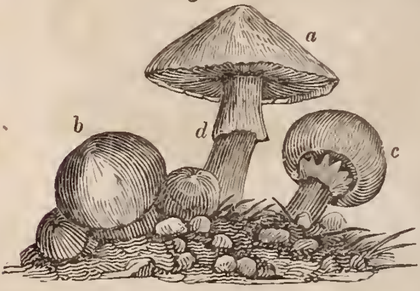
Litmus a chemical test for acids—Order Mushrooms.

remains upon the stipe, while the pileus, released from its confinement, extends upwards, and exhibits an uneven appearance upon its edge, caused by its separation from the volva. Fig. 52 represents the most important parts of the mushroom, (*a*) the gills running from the stipe to the circumference, under the pileus. (*b*,) a young mushroom with the pileus of a globular form, and not separated from the volva. *c*, the volvá or wrapper, bursting and separating from the pileus so as to exhibit the gills beneath. (*d*) part of the volva remaining upon the stipe in a circular form, and called *annulus* or a ring.

Fig. 52.



"If the mushroom be left for a time on a plate of glass, a powder will be found deposited; this is the seed or organic germ. That these are capable of germination is evident to cultivators, who now form mushroom beds, by strewing the decayed plants on prepared beds of manure."*

A species of the genus Agaricus, is common in Italy, and much valued for food; it is of a fine red and orange colour; the ancient Romans esteemed it as a great luxury. The genus *Boletus* contains the *touchwood* or *spunk*, which is sometimes used as tinder. The Lycoperdon contains the puff-ball.

It is not to be expected that you will go into a minute investigation of the Cryptogamous plants; they are probably the least understood of all the visible works of nature. Some philosophers have asserted that some of this race do not belong to the vegetable, but to the animal kingdom; they have discovered insects in the mushrooms, and they say that like the sponge, and the corals, these should be classed among animal productions. Few, however, at present entertain this belief; and the fact of their having been raised from seed sprinkled on the earth, seems to prove them to be of vegetable growth. A curious field of inquiry presents itself in the consideration of the difference between animal and vegetable life. This we shall hereafter partially examine, not however, expecting to decide upon subjects which lie hidden from the researches of finite beings; but the

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* Nuttall.

Delineation of the most important parts—Agaricus—Opinions of some philosophers respecting the Cryptogamous plants.

rather to show you, that the "ways of the Almighty are unsearchable, and past finding out!"

After what has been remarked upon the difficulty of analyzing the plants belonging to the Crytogamous class, you will not need to be discouraged, should you be baffled in your attempts to investigate them. It is well for mankind that there are philosophers, whom the enthusiasm of scientific pursuits will lead to spend years, even a whole life, in searching into the fructification of a moss or mushroom; or in examining into the natural history of an ant or a spider;* as thus, discoveries are continually brought forward, which add to the general stock of knowledge. This is a kind of martyrdom in the cause of science to which but few seem called, by the powerful impulses of their own minds. Females, in particular, are not expected to enter into the recesses of the temple of science; it is but of late, that they have been encouraged to approach even to its portals, and to dare to glance upon the mysteries within.

We have now completed our general view of the vegetable world, according to the order in which the different tribes of plants have presented themselves. As we followed in the train of classification, we have endeavoured to notice the most conspicuous, and to trace their natural relations, as well as their artificial arrangement.

In many cases, departing from the plan of general remarks, we have traced the natural history of some one genus, believing this method more likely to make a permanent impression, than merely general views. When we read the history of nations, we often feel less interested in the fate of a whole people, than in that of some prominent individual: if the imagination is presented with general ideas only, it has no opportunity of fixing itself upon any single circumstance in order to create a lively picture in the mind. The same remark may apply to natural history. When you now look back upon the view just taken of the vegetable world, and examine what impressions are most lively in your minds, you will probably find them to be respecting some particularities of individual plants. Of this tendency of the mind we should avail ourselves, by connecting these particular impressions with facts which lead us to general principles. Very narrow indeed, would be our mental vision, were it to be confined to single unconnected observations, laid up indiscrimin-

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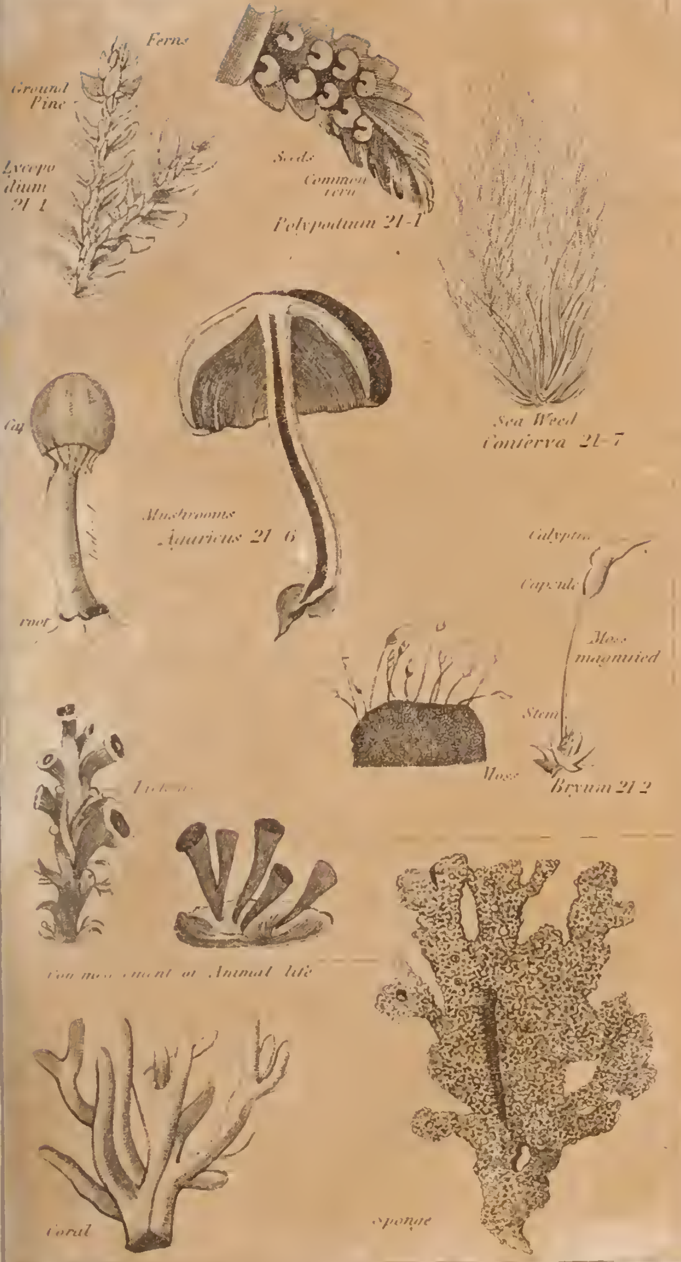
* I have been gravely assured by a naturalist of distinction, that the study of *spiders* is one of the most *elegant* and *delightful* of all pursuits.

Enthusiasm of some naturalists—View of Classification completed—General ideas make little impression on the mind—Particularities of individual plants best remembered.

ately in the storehouse of thought; but our minds, not by our own will, but by a faculty received directly from our Creator, instinctively generalize and arrange their mass of single observations; and we almost without an effort, perform that operation in the world of thought within us, which the great Linnæus effected in the vegetable kingdom.

Our minds instinctively generalize and arrange single facts.

PLATE XII


Ferns
Ground Pine
Lycopodium 21 1
Seeds
Common Fern
Polypodium 21-1
Sea Weed
Conferva 21-7
Cap
Mushrooms
Agaricus 21 6
root
Calyptra
Capsule
Moss magnified
Stem
Moss
Bryum 21 2
Lichens
Commencement of Animal life
Coral
Sponge

PART IV.

LECTURE XXXIX.

THE FLOWERING SEASON OF PLANTS.

Vernal, Summer, and Autumnal Flowers.

From the first appearance of vegetation in the spring, until the commencement of winter, nature presents an ever varying scene. The phenomenon of the flowering of plants, is in many respects, similar to that of the putting forth of leaves; in both, the same causes either hasten or retard this period. The putting forth of leaves, and the blossoming of flowers, differ however in one circumstance; the leaves begin by the upper leaf buds; the flowers by the lower flower buds; *stipes*, *panicles*, and *thyrses* begin to blossom gradually from the base to the summit. *Cymes* and *umbels* blossom from the outside to the centre.

In plants of the north, transported to the south, the period of the putting forth of leaves and blossoming is hastened; in those of the south, carried to the north, it is retarded. Even in their native soil, this period varies in some degree in different seasons. With greater warmth of temperature, we have an earlier appearance of vegetation; yet in general, this variation is so slight, that botanists are able by observation, to fix with a sufficient degree of accuracy, the time of the flowering of plants in particular latitudes and climates.

The progress of vegetation varying little from Latitude 40° to 43° north, the remarks that we make on this subject, may apply to that region of country extending south to the mouth of the Hudson, north to the mouth of the Mohawk, eastward to the Atlantic, and westward to the Pacific Ocean.

In Ohio, and the western part of New York, the climate, on account of the influence of the lakes, and the cold eastern winds from the Atlantic being broken by ranges of mountains, is mild-

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Changes in vegetation—Putting forth of leaves and blossoming of flowers agree in some respects, differ in others—Plants of the north transported to the south, and the reverse—Remarks on the progress of vegetation; to what extent of country applying.

er, and vegetation is somewhat earlier than in New England in the same latitude.

In some cases, a plant puts forth leaves and blossoms at the same time; but usually, the leaves appear before the flowers, probably having a greater force to draw up the sap than the flowers, in which it rises by slow degrees. We see little appearance of vegetable life as early as March; sometimes snow covers the ground nearly or quite through the month; but if we examine the trees and shrubs, even then, we shall see the leaf buds swelling, and ready to expand with the first vivifying influences of heat.

VERNAL FLOWERS.

In April, the leaves of trees and shrubs begin to put forth; a few flowers show themselves, amid the damp chilly atmosphere with which they are surrounded; among the most interesting of these harbingers of spring is the HEPATICA *triloba*, or liver-leaf; a lowly, modest flower, of a pale blue colour, with beautifully formed three-lobed leaves.

The low anemone, (ANEMONE *nemorosa*,*) with its pale blossoms, is now found in shady woods and damp pastures.

Among the blossoms now to be seen are most species of the poplar, a plant in the class *Monœcia*, having stamens and pistils on separate plants. The salix, or willow, is of the same class which includes the mournful weeping willow, or SALIX *tristis*, sometimes called Salix Babylonica, in allusion to a beautiful passage in the Psalms, which represents the children of Israel when carried into captivity, as sitting down by the waters of Babylon to weep, and hanging their harps on "willow trees that withered there."

Among the forest trees now in blossom, are the maple and the elm; in the meadows and moist grounds, the yellow cowslip, (CALTHA *palustris*,) a fine example of the class Polyandria; and the adder's tongue, (ERYTHRONIUM *dens-canis*,) having a beautiful liliaceous flower, which affords a good example of the class Hexandria.

In woods, and by the sides of brooks, is to be seen the sanguinaria or blood-root; which bears a white blossom, more elegant and ornamental for a garden, than many flowers which are brought from foreign countries, and affording from its root a highly valuable medicine.

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* This little flower I have seen raising its head amid surrounding snows, on the banks of the Poesten kiln, a romantic little stream which flows into the Hudson, near Troy.

Little appearance of vegetation in March—Flowers of April—Hepatica—Willow—

The CLAYTONIA, or as it is often called, spring beauty, is also to be found at this season; the dandelion too, you well know is found among the earliest flowers of spring. The garden violet which is an exotic, appears also at this time; the VIOLA *rotundifolia*, or yellow violet, with roundish leaves, lying close to the ground, is found in the fields. Besides these, are found several species of Carex, a coarse kind of grass; the trailing arbutus, EPIGÆA *repens*, and the TRILLIUM, which we remarked under the class Hexandria, as a flower exhibiting great uniformity in its divisions.

In May, many species of the *Viola* appear; there is sometimes a difficulty in determining between these species; the distinctive marks seem often to be blended; we are in such cases obliged to place our plant under that species, to which in our judgment, it seems to have most resemblance.

One of the most *interesting* flowers of this season, found in woods and maedows, is a species of ANEMONE, the Windflower, (*virginiana*,) a name, given as some say, because the flower expands only in windy weather; its petals are large and usually white, the stem grows to the height of two or three feet, and contains one terminal flower. Several other species of the Anemone are in blossom about this time.

The *Xylosteum*, or fly-honey-suckle, may be found by the side of brooks, a shrub with blossoms growing in pairs; also the UVULARIA, a plant of the lily family having a yellow blossom; and the strawberry, with its numerous stamens growing on the calyx; it has also many styles, each one bearing a seed.

The ARONIA, or shad-blossom, is an early flower, a species of which is not unfrequently found in April. It is a shrub, often growing upon the banks of brooks, with white petals, clustering together in the form of a raceme.

Many of the mosses are now in blossom; these, we trust, you have learned to consider as presenting much that is interesting, to those who understand their structure; but you will not be called on to examine the mosses in the commencement of your botanical studies, neither will they be likely to force themselves upon your notice. You no doubt were surprised to learn that they have flowers, and are considered as of any importance; but you must recollect they are the workmanship of His hand, who is no less wise in the formation of a moss, than in the creation of a world. You have learned, it is to be hoped, so much humility, as to see that all that God has made is important, and that our ignorance of the uses of natural productions, is not a proof of his want of wisdom, but of our blindness.

Dandelion, &c.—Flowers of May—Viola—Anemone, &c.—Mosses now in bloom—

The ARUM, or wild-turnip, is now in blossm; it is a curious plant, with the stamens and pistils growing on a spadix, a club-shaped organ surrounded by a spatha; it is found in shady places. The root is valuable in medicine. The CALLA *palustris*, or water arum, which is placed in the same class, is now in bloom; this is of the same genus as the Egyptian lily.

The AQUILEGIA, or wild columbine, with its horned nectaries, is found hanging in rich clusters from the clefts of rocks.

FLOWERS OF SUMMER.

The plants which are now in blossom are so numerous, that we can mention only a few of the most common, or most striking.

A well known shrub, the elder, (SAMBUCUS,) is now found along the sides of hedges, or on the margin of brooks, and in the meadows; the RUBUS, or raspberry, the RANUNCULUS, or butter-cup, the CYNOGLOSSUM, or hound's-tongue, and the TRIFOLIUM, or clover. It is recorded in history, that when Saint Patrick went as a missionary, to preach the Gospel to the pagan Irish, "he illustrated the doctrine of the Trinity, by showing them a trifolium, or three-leaved-grass with one stalk; this, operating to their conviction, the Shamrock, which is a bundle of this grass, was ever afterwards worn upon this Saint's anniversary, to commemorate this event."

In the meadows is seen at this time the GERANIUM *maculatum*, a showy flower, and almost the only American Geranium; in the woods, the splendid ladies'-slipper, (CYPRIPEDIUM,) and the wild mandrake, (PODOPHYLLUM,) a flower of curious appearance.

The genus CONVALLARIA, of which the Solomon's-seal is an example, may now be found; it is usually white, of a funnel form corolla. Some other species, as the lily of the valley, have a bell-form corolla. The various species of VACCINIUM, of which the whortleberry is an example, are now in blossom; the woods are ornamented by the snowy white cornus, or dog-wood flowers.

In the early part of June the foliage of the trees usually appears in perfection; among the earliest are the willow, poplar, and alder; next are the bass-wood, horse-chesnut, the oak, beech, ash, walnut and mulberry, which are not all usually in full leaf before the middle of June. At the summer solstice, a new race of blossoms appears; as the roses, pinks, and lilies, with many other exotics. The Iris is found in stagnant waters and in gar-

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Wild turnip, &c.—Flowers of June—Very numerous—Elder, &c—St. Patrick's use of the Clover—Geranium, &c.—Trees in perfection—Blossoms appearing at the summer solstice.—

dens. Among native plants we now find the Asclepias, or milkweed, affording a good example of the class Gynandria. The little bell-flower, (Campanula,) may be seen nodding over the brows of the rocks.

The brilliant laurel, (Kalmia,) is now in bloom, also the mullein, affording a good illustration of the class Pentandria. The climbing virgin's-bower, (Clematis,) hangs in graceful clusters of white flowers from the boughs of shrubs and trees. The curious side-saddle-flower, (Sarracenia,) which was described under the class Polyandria, is now to be found in swamps and wet grounds.

More flowers are in blossom just before the summer solstice, than during any period of the year, until the blossoming of the autumnal plants. The hot breath of summer seems to wither the expanded flowers, the earlier ones fade away, and the late ones do not immediately come forward ; it would seem as if the earth having poured forth for so long a time in rapid succession, innumerable treasures, now required a suspension of her efforts; but soon, with recovered energy, she begins to spread forth new beauties in great profusion and brilliancy.

LECTURE XL.

Autumnal Flowers—Evergreens—Ancient Superstition respecting Plants—Various Phenomena of Plants.

The autumnal flowers, are mostly in their appearance, unlike those which we find in the earlier part of the season. Few examples of the compound flowers occur, until the latter part of July and beginning of August ; this is fortunate for students just commencing the analysis of plants ; were they to find only the compound flowers at first, they would be discouraged in the commencement of the study ; but nature seems kindly to lead them on step by step, reserving the more difficult plants until they have had an opportunity of becoming familiar with the easier classes.

There is little difficulty in learning to distinguish the different families of compound flowers ; as an aster from a solidago, or a helianthus. But some of these families contain many species ; and the chief difficulty consists not in finding the genus, but in determining the species with accuracy. Indeed it is not

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After this period flowers for a short time less numerous—Autumnal flowers—Fortunate for the student that the compound flowers do not occur early in the season.—

to be concealed that there is in this part of botanical science some confusion among writers; and we should not be discouraged if we are not always able, in every respect, to bring our plant exactly under any species described.

Among the noble flowers which autumn presents, are the scarlet LOBELIA, or cardinal flower, the yellow GERARDIA, (false foxglove,) and the noble sun-flower, (Helianthus.) The modest LINNÆA *borealis*, so named from the great founder of our present artificial system of Botany, is found in September; at this time the white pond lily, (NYMPHÆA,) one of the most splendid of American flowers, is seen whitening the surface of the lakes and ponds, sometimes alternating with yellow water lily, (NUPHAR,) a flower of less striking elegance than the former, but perhaps not less curious in its form.

Another aquatic plant, which, although it blossoms in summer, continues in flower until late in the autumn, is the SAGITTARIA, or arrow-head, with a three-leaved calyx, having white petals, staminate and pistillate flowers on the same root; it belongs to the class Monœcia.

The Eupatorium, or thorough-wort which blossoms in autumn, has no external beauty to recommend it, but as a remedy in diseases, perhaps no plant is more useful. In remarking the few flowers which linger until the approach of winter, we see the hardy dandelion, which, although one of the earliest, is also among the latest of the vegetable tribes. We see among the last blossoms of the season, some compound flowers which seem for a time to bear the autumnal blasts, but which gradually give way to the reign of winter, leaving the desolate fields and meadows to present but a gloomy contrast to their former verdant and glowing appearance.

EVERGREENS.

During the season of winter in our climate, no flowers appear, except on such plants as are shielded from the inclemency of the weather; even the green house plants can scarcely be made to blossom.

The leaves of the trees, and the stems of all annual plants, are also decayed; some hardy evergreens yet retain their cheerful verdure. At Christmas, the pine, spruce, and the beautiful running or ground pine, (LYCOPODIUM,) belonging to the family of Ferns, are found in perfection, ready to welcome the anniversary of our Saviour's birth.

Some confusion among botanical writers with respect to the compound flowers—Lobelia, &c.—Sagittaria—Thorough-wort—Evergreens.—In our climate no flowers blossom in winter unless protected from the cold—Pine—Spruce, &c.

The custom of decorating churches with evergreens, is of very ancient date. On this subject an English writer observes, "The evergreens, with which the churches are usually ornamented at Christmas, are a proper emblem of that time when as God says by the prophet Isaiah, '*I will plant in the wilderness the cedar, and the myrtle, and the olive tree; I will set in the desert the fir tree and pine tree, and the box tree together.*' And in another place, '*The glory of Lebanon shall come unto thee; the fir tree and the pine tree, and box together, to beautify the place of my sanctuary; and I will make the place of my feet glorious.*'"

In the Romish church, which abounds in external observances of religion, it is customary to bear palm boughs in procession on the anniversary of the day when Christ went into Jerusalem, and the children strewed branches of palm trees before him. In more northern latitudes, box, pine, olive, and willows are used as a substitute for real palms, which do not grow there, as in Judea, by the way sides. The day on which this ceremony is performed is called palm sunday.

Superstitions with regard to the blossoming of plants.

In the Romish church, many superstitions exist with regard to some plants which happen to blossom about the time of certain Saint's days. In Italy and other countries in the south of Europe, where these superstitions first originated, the dead nettle is in blossom about the time of St. Vincent's day, a martyr who suffered for christianity under the Emperor Dioclesian, in the year 304.

The winter hellebore is usually in blossom about the time of the conversion of St. Paul, supposed to be in commemoration of that event.

The Crocus was dedicated to St. Valentine, as it appears about the period of that Saint's day, which is regarded as peculiarly sacred to affection; St. Valentine is recorded to have been eminent for love and charity. One species of daisy appears about the time of St. Margaret's day; this is called in France, La Belle Marguerite, and in England, Herb Margaret.

The Crown Imperial blossoms about the 18th of March,* the day of St. Edward, who was King of the West Saxons, nature thus, as was imagined, honoring the day with a royal flower.

The Cardamine, or our Lady's flower, distinguished for its pure white, is dedicated to the Virgin Mary.

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* In England.

Decorating churches with evergreens—Palm Sunday—Superstitions in the Romish church with regard to the blossoming of certain plants—

The mary-gold, so called from a fancied resemblance of the florets of its disk to the rays of glory around the Virgin's head.

On St. George's day, (the patron saint of England,) the blue bells, there called field hyacinth, tinge the meadows and pastures with their deep blue color; they are thought to afford an emblem of the empire of the ocean, over which England assumes the rule.

The St. John's-wort blossoms near that saint's day. The scarlet Lychnis, called the great candlestick, or candle, (CANDELABRUM *ingens*,) lighted up for St. John the Baptist, who was a burning and a shining light. The white lily expands about the time of the annunciation to the Virgin Mary, affording another coincidence of the blossoming of white flowers at the festivals consecrated to the mother of Christ. The roses of summer are particularly said to fade about the period of St. Mary Magdalen's day.

The passion flower is said to blossom about Holy Rood day. Allusions to this day being frequently found among writers of former days, it may be well to inform you that according to the legends of the Romish church, the cross on which our Saviour was crucified was discovered in the year 326, by Helena, the mother of Constantine, who is said to have built a church on the spot where it lay. The word *Rood* signifies the Cross; thus this day is the day of the Holy Cross.

It was during the middle ages, when the minds of men were influenced by the blindest superstition, that they thus imagined every operation of nature to be emblematical of something connected with their religious faith. Although these superstitions are trifling and absurd, they are interesting as connected with the annals of the human mind, and as shewing us the origin of many names of plants. Had the superstitious monks and nuns, who were the authors of these conceits, and at that, time the most learned part of the community, been possessed of as much knowledge as most children in our country, they would have known that plants bloom earlier or later, according to various circumstances of climate; and that a flower which in Italy blossoms as early as February might not appear in England before April; while the day of the Saint which the flower was supposed to commemorate, would occur at the same time in both places.

During the middle ages men imagined the operations of nature connected with their peculiar religious tenets—Ignorance of the monks and nuns.

VARIOUS PHENOMENA OF PLANTS.

Plants exhibit some phenomena which are supposed to arise from the state of the atmosphere; accurate observers of nature have made remarks upon these changes in plants, as preceding certain changes of weather. Lord Bacon, who was remarkably attentive to all the appearances and changes of natural objects, is the author of some of the observations which we will now quote.

"*Chickweed, Anagallis.*—When the flower expands boldly and fully, no rain will happen for four hours or upwards: if it continues in that open state, no rain will disturb the summer's day; when it half conceals its miniature flower, the day is generally showery; but if it entirely shuts up or veils the white flower with its green mantle, let the traveller put on his great coat, and the ploughman, with his beasts of draught, expect rest from their labor.

"*Siberian Sowthistle, Sonchus.*—If the flowers of this plant keep open all night, rain will certainly fall the next day.

"*Trefoil, Hedysarum.*—The different species of trefoil always contract their leaves at the approach of a storm: hence these plants have been termed the Husbandman's Barometer.

"*African Marygold.*—If this plant opens not its flowers in the morning about seven o'clock, you may be sure it will rain that day unless it thunders.

"*White thorns* and *dog-rose bushes.*—Wet summers are generally attended with an uncommon quantity of seed on these shrubs whence their unusual fruitfulness is a sign of severe winter."

Beside the above there are several plants, especially those with compound yellow flowers, which nod, and during the whole day turn their flowers towards the sun, viz. to the East in the morning, to the South at noon, and to the West towards evening. This is very observable in the sowthistle, *Sonchus arvensis*; and it is a well known fact, that a great part of the plants in a serene sky, expand their flowers, and as it were with cheerful looks behold the light of the sun; but before rain, they shut them up, as the tulip.

The flowers of the chick-wintergreen, (*Trientalis*,) droop in the night, lest rain or moisture should injure the fertilizing pollen.

One species of *woodsorrel*, shuts up or doubles its leaves before storms and tempests, but in a serene sky expands or unfolds them, so that husbandmen can foretel tempests from it. It

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Various phenomena of plants—Lord Bacon's observations—Plants which turn towards the sun—Hang their heads at night and in storms—Changes of flowers indicating changes of weather.

is also well known that the sensitive plants, and cassia, observe the same rule.

Besides affording prognostics, many plants also fold themselves up at particular hours, with such regularity, as to have acquired particular names from this property. The following are among the more remarkable plants of this description.

Goatsbeard.—The flowers of both species of *Tragopogon*, open in the morning at the approach of the sun, and without regard to the state of the weather, regularly shut about noon. Hence it is generally known in the country by the name of *go-to-bed-at-noon.*

The *Princesses' leaf*, or *four o'clock flower*, (*Mirabilis*,) in the Malay Islands, is an elegant shrub, so called by the natives, because their ladies are fond of the grateful odour of its white leaves. It opens its flowers at four in the evening, and does not close them till the same hour returns, in the morning. Many people transplant them from the woods into their gardens, and use them as a dial or clock, especially in cloudy weather.

The *Evening Primrose*, (*Œnothera*,) is well known from its remarkable properties of regularly shutting with a loud popping noise, about sunrise, and opening at sunset. After six o'clock, these flowers regularly report the approach of night.

The *tamarind tree*, the water lily, (*Nymphæa*,) the marygold, the false sensitive plant, and several others of the Diadelphia class in serene weather, expand their leaves in the day time, and contract them during the night. According to some botanists, the tamarind tree enfolds within its leaves, the flowers or fruit every night, in order to guard them from cold or rain.

The flower of the garden lettuce, which is in a vertical plane, opens at seven o'clock, and shuts at ten.

" A species of serpentine aloes, without prickles, whose large and beautiful flower exhales a strong odour of the Vanilla during the time of its expansion, which is very short, is cultivated in the imperial garden of Paris. It does not blossom until towards the month of July, and about five o'clock in the evening, at which time it gradually opens its petals, expands them, droops and dies. By ten o'clock the same night, it is totally withered, to the great astonishment of the spectators who flock in crowds to see it.

" The *cereus*, a native of Jamaica and Vera Cruz, expands an exquisitely beautiful flower, and emits a highly fragrant odour, for a few hours in the night, and then closes to open no more. The flower is nearly a foot in diameter, the inside of the calyx, of a splendid yellow, and the numerous petals are of a pure

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The Go-to-bed-at-noon—The four o'clock—Evening Primrose—Night-blooming Cercus, &c.

white. It begins to open about seven or eight o'clock in the evening, and closes before sunrise in the morning.

"The flower of the dandelion possessses very peculiar means of sheltering itself from the heat of the sun, as it closes entirely whenever the heat becomes excessive. It has been observed to open in summer at half an hour after five in the morning, and to collect its petals towards the centre about nine o'clock."

Linnæus has enumerated forty-six flowers which possess this kind of sensibility: he divides them into three classes.

1. *Meteoric flowers*, which less accurately observe the hour of folding, but are expanded sooner or later, according to the cloudiness, moisture, or pressure of the atmosphere.
2. *Tropical flowers*, that open in the morning, and close before evening every day, but the hour of their expanding becomes earlier or later, as the length of the day increases or decreases.
3. *Equinoctial flowers*, which open at a certain and exact hour of the day, and for the most part close at another determinate hour.*

LECTURE XLI.

Habits of plants.—Agents which affect their growth. Their habitations, and geographical situations.—Elevation corresponding to latitude.

The constitutions of plants and that of animals seem to fit them for particular climates and for digesting food of a certain kind. The plant cannot like the animal rove about in search of food best suited to its nature, but fixed in one spot, must receive the nourishment that there offers itself. If this nourishment is too abundant, the vessels becoming loaded with excess, cease to perform their accustomed functions, and the plant dies of *surfeit*; if on the other hand the food offered is too little or not sufficiently nourishing, the plant dies of *starvation.*

Yet plants may be brought to live in climates, and on food not naturally suited to their constitutions; or in other words their *habits* may be changed. Although we may suppose that many things now necessary to our comfort and even our lives, are rendered so by nature; yet if we reflect a moment we shall

* Bacon.

Meteoric flowers—Tropical, Equinoctial.
The constitution of plants fitted for particular climates.

see that very many of our own wants are the result of habit. Did you never see the children of poor parents running about in the snow with bare feet, and apparently much more healthy than the little master or miss whom a servant must carry to school, for fear the winds of heaven may visit them too roughly? Why does this difference exist between those of the same species? It is owing to *habit*. Thus we may see lingering almost upon the verge of a northern winter, the nasturtion; but the same temperature which it bears without injury, would at once destroy those of the same species which have flourished only beneath a tropical sun.

In changing the habit of a plant, or as it is frequently termed, *naturalizing* it, the *temperature* is the principal thing to be considered; although the soil and the quantity of moisture should be rendered as similar as possible to those of its native habitation.

Plants from warm climates are accustomed to a lower temperature by placing them in hot-houses, then in green-houses, and lastly in the open air. While the plant is going through with this kind of discipline, an opportunity is afforded of observing the kind of soil most favorable to its growth, the quantity of moisture which it requires, the degree of light which seems necessary, and the kind of exposure as to wind which appears most favorable.

Plants vary much in their susceptibility of naturalization. The horse-chesnut which is now common in the middle and northern United States, was originally brought from the tropical regions. In these regions however it usually grows in grounds somewhat elevated above the level of the sea, and therefore its habit as to temperature, renders it in some degree fitted for more northern countries. Orange and lemon trees cannot be brought to bear the roughness of our climate, without some protection.

In many cases perennial plants, by this change of climate, are converted into annual ones; that is, as if fearing the inclemencies of a cold winter, they pass through their successive stages of existence with rapidity, and accomplish in one summer what they had been accustomed to require years to perform. The nasturtion was originally a shrub flourishing, without cultivation on the banks of the Peruvian streams; yet transferred to this country it is an annual plant, which completes its term of existence in a few months.

The habits of some plants are with difficulty subdued; and

Remarks on their habits—Their nourishment—Their habits—Instance, nasturtion—Temperature considered in the naturalization of plants—Observations necessary in the process—Plants vary in susceptibility of naturalization—Some change from perennial to annual.

it is by slow removals that they can be made to grow in foreign situations. Rice by a slow progress has advanced from Carolina to Virginia, and it is now cultivated in New Jersey. The habits of Indian corn aided byclimate and culture, have suffered a still more remarkable change. After having been several years raised in Canada, it arrived to perfection in a few weeks, and on that account is employed by us as an early corn. But that which has been long cultivated in Virginia, will not ripen in a New England summer; yet, originally, the early corn of Canada and that of Virginia were the same, both in habit and other properties.

Agents which affect the growth of plants.

Of the various substances by which vegetables are nourished, *water* is thought the most important. Some plants grow and mature, with their roots immersed in water, without any soil; most of the marine plants are of this description.

Atmospheric air is necessary to the health and vigor of plants; if a plant is placed under a glass into which no air can enter, it withers and dies.

Most plants are found by analysis to contain a certain portion of salts, such as nitre, and muriate of soda, or common salt. It is thought that the root absorbs them from the soil by which it is nourished.

No plants have been made to grow without *heat*, though some require a greater portion of it than others.

Plants may be made to grow without *light*, but they will not exhibit the verdure, or any of the properties of health. The atmosphere, which is contaminated by the respiration of animals, is restored to purity by the vegetation of plants; but secluded from light, vegetables are no longer capable of converting a portion of the fixed air to their use, or of supplying the atmosphere with oxygen, on which its importance in supporting animal life chiefly depends. By the action of light, the carbon of the fixed air is interwoven with the texture of the plants. The aromatic plants, the clove, cinnamon, and the Peruvian bark, all owe their chief excellencies to the light of the sun.

HABITATIONS OF PLANTS.

Plants are not thrown by chance over the surface of the globe, but we perceive that the Creator has regulated their distribution according to certain fixed principles; we find not only

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Of rice and Indian corn. Agents which affect the growth of plants—Water—Atmospheric air—Salts—Heat—Light. Habitations of plants.

a wonderful adaptation of plants to the physical necessities of animals in general, but they are also varied to correspond to the peculiar wants of animals in different climates.

First, we would notice the herbs which cover the surface of the earth; had their stems been hard and woody, the greater part of the earth would have been inaccessible to the foot of man, until the vegetation was first destroyed by fire, or by some other means. Shall we suppose that the grass and herbs which now afford a soft carpet for our feet, came *by chance* to grow thus, rather than hard and woody like the trees? Shall we suppose, too, that by chance the prevailing colour of vegetation is *green*, that colour upon which, above all, the eye rests with the most agreeable sensations? Suppose the grass and herbs to have been red or yellow, and with our present organs of sight, how painful would be the sensations excited by these bright colours! Instead of beholding nature with delight, we should turn from it, and vainly seek some object on which the eye might repose.

Woody shrubs occasionally alternate with herbs, but they are so placed as not to offer obstructions to the foot of man; they often grow out of the clefts of rocks, affording a means of climbing almost perpendicular precipices. Large trees are not usually placed so near together as to prevent a passage between them; their lowest branches are mostly at a height sufficient to admit men and beasts under them, and thus, few forests are impenetrable.

In cold countries, whether occasioned by distance from the equator, or elevation by means of mountains and table lands, we find the pine, fir, and cedar, and other resinous plants, which furnish man, during his dreary season of winter, with light and fuel. The leaves of these trees are mostly filiform, or long and narrow, thus fitted for reverberating the heat, like the hair of animals, and for resisting the impetuosity of winds, which often prevail in those regions.

In warm countries, trees present in their foliage a resource from the scorching rays of the sun; their leaves serving as fans and umbrellas. The leaf of the banana is broad and long, like an apron; it has acquired the name of Adam's fig leaf. The leaves of the cocoa tree are said to be from twelve to fifteen feet long, and from seven to eight broad. Those of the talipot tree are equal in size. A traveller remarks respecting the leaves of the talipot tree, that one is capable of covering from fifteen to twenty persons. The soldiers, he says, use it for a covering

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Not thrown by chance over the surface of the earth—Trees of cold countries—Of warm countries.

to their tents. He remarks, that it seems an inestimable blessing of Povidence in a country burnt up by the sun, and inundated by rains for six months of the year. In our climate during the warm seasons, Providence bestows upon us a variety of juicy and acid fruits, cherries, peaches, plums, melons, and berries; the nuts and many fruits are fitted for preservation during the winter, so that we are never destitute of these bounties.

A remarkable instance of the care of Providence in providing for the wants of man, appears in what is related of a plant found amidst the burning deserts of Africa; the leaf of which is said to be in the form of a cruet, and to possess the property of secreting moisture to such a degree as to form a quantity of water sufficient for a draught to a thirsty person;† the end of the leaf is folded over the throat, as if to prevent the evaporation of the fluid. Various plants and trees, in hot regions, furnish refreshing draughts to the thirsty traveller.

These remarks might be pursued to an extent as great as the vastness of the vegetable kingdom, and wants of man; we have merely glanced at the subject of the adaptation of plants to the wants of animal life, hoping that as the subject has been suggested, you may be led to trace, from your own observation of the works of nature, the great designing mind, which rules and governs all with infinite wisdom and benevolence.

The earth, then, we find to be covered with a multitude of species of plants, differing not more by their external forms, than by their internal structure, each endowed with peculiar habits and instincts.

Some species seem adapted to the mountain, some to the valleys, and others to the plains; some require an argillaceous or *clayey* soil, others a calcareous soil, or a soil impregnated with *lime;* others a quartzose or *sandy* soil, and some will only grow where the earth contains soda or marine salts. Many plants will only grow in water; we find here such as are peculiar to the marsh, the lake, the river, and the sea. Many plants require a very elevated temperature, some will grow only in mild and temperate climates, and others only in the midst of frosts and snows.

Thus every country where man is to be found has its vegetation. Some species of plants, with respect to localities, are confined to narrow limits.

A species of ORIGANUM, the *tournefortii*, discovered by

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† This plant, from the general description of the leaf, would seem to be the Sarracenia; this, however, only grows in marshes.

Different species of plants require different kinds of situations and soils —Some grow in water, &c.

Tournefort, in 1700, upon one single rock in the little island of Amorgos, was found eighty years afterwards in the same island, upon the same rock, and has never been discovered in any other situation. Some plants appear to confine themselves within certain longitudes, scarcely varying from the right to the left. The Menziesia *pallifolia*, a species of heath, confined between ten and fifteen degrees of west longitude, is found in Portugal, Spain, and Ireland. Latitude and elevation, by reason of mountains and table lands, produce a greater variety in the appearance of vegetation than almost any other causes.

Few plants are found to endure extreme cold. Botanists have estimated, that at Spitsbergen, in north latitude about 80°, there are but about 30 species of plants; in Lapland, in 70°, there are 539 species; at Madagascar, at the tropic of Capricorn, there are 5000; and at the equator a much greater number. These estimates fall very far short of the number of species now known, but they may give some idea of the difference in the vegetation of cold and warm climates.

GEOGRAPHICAL SITUATION OF PLANTS.

In investigating the geographical situation of the vegetable kingdom, we see the powerful effects of light and heat. Feeble in the polar regions, vegetation acquires strength as we approach towards the equator, where the light of the sun is vivid, and its heat permanent and intense. The centre of the *frigid zone* is entirely destitute of vegetation. After passing the arctic circle, we find on the borders of the temperate zone a few species of plants, chiefly lichens, mosses, and ferns, also a few shrubs and berries. In the heat of a polar summer, the growth of plants is rapid; Lapland is the only country within this zone where any kind of grain can be raised.

The productions of the *temperate zone* gradually alter in character as we approach the tropics. Humboldt has divided the temperate zone with respect to productions, into three regions: the *cold*, the *temperate*, and *warm regions*. In the cold region, *grain* may be raised to advantage, and *berries* grow in abundance. In the temperate region, the *wine grape*, *grain*, and fruits of many kinds, are cultivated in their greatest perfection. The warm region produces *olives*, *figs*, *oranges* and *lemons*.

The variety of plants in the *torrid zone* is very great. Trees are more numerous in proportion to other plants, than in the temperate zones; the same tribes which are there slender and

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Some have a confined locality—Few endure extreme cold. Geographical situations of plants—Frigid zone—Temperate zone—Torrid zone.

humble plants, here spread into lofty trees, many of which are adorned by large and beautiful flowers. The richest fruits and spices, and the most valuable medicinal plants are found here. In ascending the mountains of the torrid zone, as the temperature varies, each section has its own distinct plants, and we find in succession, the production of every region from the equator to the poles.*

As the mountains of the torrid zone afford every variety of climate between their base and their summit, so they are capable of producing all the vegetables of every climate; but as the temperature diminishes, as the latitude increases, so, generally speaking, the productions, as we proceed from the tropic northward or southward, correspond with the elevation at which the same plants will grow upon a mountain within the tropics. Every plant requires other circumstances alike; the same mean annual temperature,† for example. The magnificent plantain tree and valuable sugar cane require a mean annual heat of 82 to 73 degrees, but 73 degrees of mean annual heat, is not found beyond the 27th degree of latitude; consequently, the plantain and sugar cane will not ripen in the open air in a higher latitude; and this Baron Humboldt has found to correspond with the height of 3000 feet under the equator; the cotton plant will not flourish without 68 degrees of heat, which is not found beyond 34 degrees of latitude, which corresponds with about 3,600 feet of elevation at the equator. The same reasoning applies to all other plants, with the exceptions arising from warm vallies, moisture of air, and richness of soil.

SEE PLATE I.

	Feet.
The highest spot on which man ever trod,	19,400
The highest limit of the lichen plant,	18,225
The lowest limit of perpetual snow under the equator,	15,730
The highest limit of pines under the equator,	12,801
The highest limit of trees under the equator,	11,125
The highest limit of oaks under the equator,	10,500
The highest limit of the Peruvian bark tree,	9,500
The lowest limit of pines under the equator,	5,685
The highest limit of palms and bananas,	3,280

* See plate 1.

† For explanation of mean annual temperature, see note under vines, Lecture 22.

Production of every region found in ascending mountains of the torrid zone—Elevation produces similar effects on vegetation, as distance from the equator.

LECTURE XLII.

Plants as affected by cultivation.

You may recollect that we have before remarked, upon the permanence of *species*, and have observed that although they may in some respects be varied by cultivation, yet their distinctive characters will not be wholly lost. The differences which exist in species are expressed by the terms, *races*, *varieties*, and *variations.*

Races are those differences in a species which are of a striking kind, and continued from the parent plant to its offspring by being propagated by the seed. They are produced by strewing pollen of one species upon the pistils of another; the seed thus formed will produce a plant resembling both.

Varieties are a less important distinction than races; they are not continued by means of the seed, but produced by grafting or continuation of the plant under some new circumstances.

Variations denote the slightest kinds of difference; they are occasioned by peculiarities of climate, soil, moisture, dryness &c. All these terms, races, varieties and variations are often used indiscriminately for each other.

Degeneration or change of the organs of plants.

The organs of plants owing to peculiar causes, often experience a metamorphosis, and instead of their usual appearance exhibit anomalies or vegetable deformities.

We use here the term deformity, as signifying any variation from the ordinary course of nature. The causes which produce these changes are,

1st. The adhesion of parts usually separate; thus we often see flowers, leaves and fruits united, and appearing double.

Some writers, among whom is the celebrated French botanist, De Candolle, assert that the single petal which forms the corolla of many flowers as the stramonium or the blue bell, is in reality composed of several petals which become soldered, or cohere together before the flower expands. The same writers consider a monophyllous calyx, to be in reality composed of several little leaves thus united before their developement.

Plants affected by cultivation—Permanence of species—Races—Varieties—Variations—Changes of the organs of plants—Deformities.—

2nd. Changes are occasioned by a want of *vigour* in the plant to bring all the parts to maturity. Some of the seeds thus often fail for want of nourishment; many plants which in one flower produce several seeds, often ripen no more than one. The horse-chesnut has six seeds, but seldom matures more than two; in the blossom of the oak where six seeds are produced, but one acorn is perfected.

3d. In some cases organs appear from certain changes to be incapable of performing their original offices, and thus exhibit deformities; as where a bud is formed, which for want of sufficient nourishment, or some other cause does not develope itself into a leaf, but forms a permanent protuberance or swelling upon the stem. The prickly pear exhibits a thick and expanded stem, which is formed of leaves imperfectly developed.

4th. The stamens and pistils through excess of nourishment, swell out, and become petals; all double flowers are formed in this manner. The poppy has many stamens, and but four petals; but you often see double poppies, with scarcely the vestige of a stamen left; the same change may be observed in the rose, which naturally has but five petals and many stamens and pistils, but in a very full double rose scarcely any appearance of either stamen or pistil is to be seen. The stamens more frequently than the pistils meet with this metamorphosis; as they appear to be more intimately connected with the petals than the pistils.

5th. The petioles or foot stalks often change to leaves. This may be seen in an Arabian plant Acacia *zilotica*, which furnishes the gum arabic. This tree at first exhibits upon one petiole six or eight pair of leaves; this number every year becomes less, until all the leaves disappear; the petiole then retaining all the nourishment which before was distributed to the leaves, flattens and expands, and appears in the form of a thick leaf. The trees which we call Acacia are not of this genus, but of the genus Robinia.

6th. The peduncles and petioles, sometimes change into tendrils, as in the vine; this plant at first throws out many large leaves and clusters of flowers; but the food not being sufficient to support such a profuse vegetation, the new leaves and clusters of flowers appear smaller; the nourishment becoming still more scanty, at length neither flower or leaf is developed, and the peduncle and petiole become tendrils, which by attaching themselves to some firm bodies, serve to sustain the rich fruit which is perfected on the flower parts of the branch.

7th. The last change we shall notice is the transformation of

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What changes are occasioned by—How changed.—

buds into thorns. When a plant forms more buds than it can nourish, some of them do not develope branches and leaves, but becoming hardened by the accumulation of sap which is insufficient for their full perfection. They exhibit the short indurated process called a thorn. It is said that wild plants by rich cultivation, do in time become divested of their thorns, which change into what they seemed originally destined for, viz. leaves and branches.

Prickles, such as may be seen upon the rose gooseberry and other plants, do not change by cultivation, for these are a natural appendage, originating from the bark ; while the thorn may be found connected with the wood, of which it seems to make a part.

DISEASES OF PLANTS.*

The diseases of plants, for these organized beings, are like animals, subject to disease and death, may in many cases arise from causes within the knowledge of the attentive naturalist.

1st. We notice constitutional diseases. Of this class are the varied colors of some leaves such as the box and holly ; this is supposed to be owing to certain juices which by changing their elements, vary the color of the leaf.

2nd. Plants seem diseased by being subjected to too great or too scanty a supply of food, as light, heat, water, air and soil. Excess of *light* causes an escape of oxygen, and a too rapid deposit of carbon ; the sap incapable of sustaining so great a degree of action, becomes exhausted, the plant withers, and the leaves fall off. In this situation the food should be either increased by watering or the vegetation retarded by diminishing the light. Excess of *heat* absorbs the juices of the plant ; deficiency of heat produces dropsy and the plant losing its leaves ultimately decomposes. More water is evaporated by a plant than is retained for its nourishment ; therefore the more that is absorbed by the roots, the more should be evaporated by the leaves.

3d. External injuries often affect the health of plants. Rains injure the wood by penetrating through apertures in the bark. The bark seems from its nature better fitted to bear the action of the weather. *Winds* when violent are mechanically distructive to vegetables ; when moderate, the agitation which they produce is thought to be advantageous, by favoring the

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* This constitutes a department of Botany called *pathology* ; a term derived from two Greek words *pathos* disease, and *logos* account.

Thorns and prickles—Diseases of plants—How produced—Effects of light, heat, water, air and soil—External injuries.

descent of the cambium, and promoting a more free circulation of the other juices.

Smoke is injurious to plants, it being composed of particles, which although invisible to our sight, are yet too gross to be absorbed by the minute pores of the leaves; it serves therefore, to obstruct the pores, and prevent their exhaling the oxygen gas which is necessary for the decomposition of the carbonic acid and the consequent deposition of carbon.

4th. Plants sustain injuries from animals which produce diseases. Insects in particular make their way into the bark and external coats of the plant and deposit their eggs; these eggs when hatched produce larvæ which often by their peculiar juices rot the wood. These insects are called *cynips.* One kind produces the hard protuberances on trees of different kinds, which are called gall-nuts, or nut-galls; others which are softer and more spongy are called apple-galls or berry-galls. Another kind of insect, called *cochineal* attaches itself to the bark of trees, and preys upon the juices. One species of the cochineal is of a brilliant scarlet color and much valued for its use in dyeing; this species feeds on the *Cactus opuntia*, a Mexican plant.

5th. Diseases are produced by plants preying upon each other, either by fastening themselves upon their surfaces, or by so near a location as to deprive others of their necessary food. *Parasites* fasten themselves upon the surfaces of other plants; they are distinguished into two kinds, the *false* and *true parasites*; the former adheres to the plant without feeding on its juices, as mosses and lichens. These derive their nourishment from the atmosphere, but they injure the tree by harboring ininsects and by attracting moisture, which often rots the part of the stem on which they grow. The misseltoe is a true parasite whose root piercing the bark of trees, plants itself in the alburnum, and absorbs food from it, in the same manner as if were fixed in the soil. The Pterospora is a very curious parasite which is sometimes found upon the leaves of shrubs;* but more frequently upon the branches and leaves of trees. Mushrooms are of the class of false parasites. *Smut* is a black fungus, which fastens itself upon the ears of oats and other grain. The *rot* is a fungus excrescence which preys upon the seed; if seeds which have this disease fastened upon them are sown, the rot will be propagated also. *Ergot* is a disease mostly confined

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* A species of this genus was found in the woods east of Troy, upon the leaf of the Vaccinium. The color of the whole plant, consisting of two flowers a and kind of leaf, was that of a red rose.

Smoke—Insects—Plants injurious to each other—Parasites.—

to rye. *Rust* is chiefly confined to the grasses; both are of the fungi family.

6th. Diseases resulting from age. Plants differ from animals in one important circumstance; the latter develope their organs at once, these organs in progress of time become indurated, and obstructed until they at length decay from old age. Plants, on the contrary, renew themselves every year; that is, they form new vessels to convey the juices, new leaves to elaborate them and new buds to produce flowers and fruits. Plants do not then like animals, seem destined to die with old age; or there does not seem to be in perennial plants any prescribed term of existence. The producing of fruit appears to exhaust the vital energy of the plant, in annuals in one year, in biennials in two, in perennials, in a longer or shorter period according to their natural constitution, and the quantity of fruit which they produce. Apple trees which bear heavy loads of fruit, are very short lived in comparison with the oak, which perfects from each flower, but one of six seeds, and this fruit is but a small acorn.

There are some trees now known to exist, which are supposed to be of great age; in the Island of Teneriffe is the Dracaena *draco*, which according to many circumstances may seem to have some thousand years of age. In England at Bolenheim Park, it is said, may be seen trunks of trees which shaded the bower, of fair Rosamond, and which it is supposed are not less than a thousand years old.

At Hartford in Connecticut is the charter oak, which was an old hollow tree in the days of James II. 143 years ago. In the hollow of this tree was concealed the charter of the state when the King of England, through his agents attempted to deprive the colonists of that guarantee of their civil rights. This oak must even at that period have been an aged tree.

Cultivation of Plants.

Trees. We find the trees of tropical regions to be much more varied in their characters than in more northern regions; the same fact may be observed in ascending mountains, whose bases often present oak, walnut, birch, chesnut, &c, while their summits afford only pines and firs.

The surface of the earth seems naturally divided into forests and meadows; the most extensive kind of the latter division, is exhibited in the *steppes* or *prairies* of the western regions of the United States, extending to an immense distance with no other vegetation than tall grass which rises to the height of six or eight feet.

Diseases resulting from old age—Aged trees.—Cultivation of plants—Trees—Their comparative variety in tropical regions—Forests and meadows exhibited in steppes and prairies.—

Trees with respect to their wood, may naturally be divided 1st, into such as have hard wood, as the oak, elm, apple, &c. 2d, such as have soft wood, as the poplar and willow. 3d, such as have resinous wood, as the pine and fir. 4th, such as are evergreens but not resinous, as the evergreen oak of the south of Europe

The fermented juice of the grape produces wine. Grain of different kinds produces gin, whiskey &c. Apples by their fermentation produce cider; this liquor, concentrated by distillation, produces brandy and alcohol.

The vineyards of Italy and France and of some of the Atlantic islands are the most celebrated for their wine. In America, the vine does not flourish in the same luxuriance as upon the eastern continent

Grasses are the palms of cold climates; they are of the class of monocotyledons, and have endogenous stems. Some are perennial, some annual;the meadow grasses are of the former kind. The grains, Indian corn and rice are annual. There are certain grasses which are called artificial, because they do not spring up without cultivation; of this kind is clover, a leguminous plant, of the artificial class diadelphia; Saintfoin and lucerne are of the same natural and artificial class.

Gramineous plants although very important as furnishing from their leaves food for cattle, are yet more especially useful for their seeds which furnish food for man. *Tuberous roots* afford the turnip, potatoe, artichoke, beet, carrot, parsnip, &c.

Some plants furnish oils, which are of important uses in various ways. Of the fixed and volatile oils we have already spoken. The fixed oils are extracted from plants called oleaginous; they may be considered under three heads 1st, olive oil produced from the olive in warm countries; 2d, nut oil of temperate climates, as obtained from walnuts, &c; 3d, oil obtained from the seed of oleaginous or oily plants, as the flax.

Asparagus when young is eaten for food; the rhubarb plant is used in making pies; celery is esteemed a luxury; onions and even garlic are esteemed valuable for food and seasoning. Many of the labiate plants, as thyme, sage, &c, are used in cooking. The Cruciform family presents us with the cabbage, cauliflower, turnips, &c. The Leguminous family affords beans, peas, &c.

The Cucurbitaceæ furnishes us with melons, squashes and cucumbers. Umbelliferous plants present us with the aromatics, caraway, coriander, &c, which are useful in medicine and confectionary.

Wood of trees hard, soft and resinous—Evergreen—Product of fermented juices of fruits—American vine—Grasses of cold climates—Annual grains—Artificial grasses—Gramineous plants, and Tuberous roots, what they afford—Oleaginous plants—Plants useful for food—Umbilliferous plants how useful.

LECTURE XLIII.

History of Botany from the Creation of the World, to a Revival of Letters in the reign of Charlemagne, in the year A.D. 770.

We are now to enter upon a part of our course of botanical investigations, which, if you have well understood the preceding lectures, will be highly interesting; it will require little effort of thought to comprehend, and will be less encumbered with technical terms than the other departments.

We propose to give an account of the progress of botanical knowledge; and this being closely connected with other sciences, you may consider it as a general view of the progress of natural science.

After becoming familiar with a science, the mind very naturally seeks for information respecting its origin, and the progress by which it advanced from the first rude conceptions which might have been formed, to its gradual developement and comparative perfection.

The history of the progress of a science makes a part of the science itself; we are interested in the various efforts of philosophers, their experience and observations, and the trains of reasoning by which they have arrived at those conclusions which are the basis of science.

In botany as in the other sciences, physical wants were the first guides; man at first sought to find in vegetables, food, then remedies for diseases, and lastly amusement and instruction.

The first account of plants may be traced to the history of the creation by Moses. It was on the third day of this great work that God said, "Let the earth bring forth grass, the herb yielding seed, and the fruit tree yielding fruit after his kind, *whose seed is in itself*, upon the earth: and it was so; and the earth brought forth grass, and the herb yielding seed after his kind, and the tree yielding fruit, whose seed was in itself after his kind; and *God saw that it was good*." After this, it is recorded that God gave to Adam every herb and every *tree bearing fruit;* the latter was for him exclusively, but to the beasts of the earth, and the fowls of the air, and to every thing wherein there is life, he also gave the *green herb* for meat.

It is recorded that Adam gave names to all the beasts of the field and the fowls of the air; and Milton, imagines that to Eve was assigned the pleasant task of giving names to flowers, and

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History of botanical science—After becoming familiar with a science we wish to know its history—First account of plants traced to the history of the creation—Milton imagines that Eve gave names to the plants and numbered their tribes.

numbering the tribes of plants. When our first parents, after their wicked disobedience of the Divine command, are about to leave their delightful Eden, Eve, in the language of the Poet, with bitter regret exclaims:

"Must I thus leave thee, Paradise? thus leave
Thee, native soil, these happy walks and shades,
Fit haunt of Gods, where I had hope to spend,
Quiet, though sad, the respite of that day,
That must be mortal to us both? Oh flowers
That never will in other climate grow,
My early visitation, and my last
At even; which I bred up with tender hand,
From the first opening bud, and *gave ye names;*
Who now shall rear ye to the sun, *or rank*
Your tribes, and water from the ambrosial fount?"

The Bible, and the poems of Homer, afford us the only vestiges of the botanical knowledge of the earliest ages of the world.

Great advantages were afforded to the Jews for obtaining a knowledge of plants, in their long wanderings over the face of the earth, before they settled in Judea. When in possession of this fertile country, they extended their intercourse with foreign nations; the vessels of Solomon frequented the shores of the Red Sea, the Persian Gulf, and the East Indian Islands. In the Book of Kings it is said, "God gave Solomon wisdom and understanding above all the children of the East country, and all the wisdom of Egypt, for he was wiser than all men. He spake proverbs and songs; he also spake of *trees*, from the *cedar tree* that is in Lebanon even unto the *hyssop*, that springeth out of the wall; and people from all countries came to hear his wisdom."

The Magi, or "wise men of the east" cultivated the sciences to a great extent; but they kept their discoveries in mysterious concealment, in order the better to tyrannize over the minds of the people. Their researches were in a great measure lost to the world. Greece, however, received from Asia and Egypt the first elements of knowledge.

The philosophers of Greece, too eager to learn nature at one glance, were not satisfied with the slow process of observation and experiment, and to ascend from particular facts to general principles; but they believed themselves able, by the force of their own genius, to build up systems that would explain all phenomena; supposing that man had in his mind, preconceived ideas of what nature ought to be. This error in the philosophy of the ancients, for a long time obstructed the progress of all science; and it was not until laying aside this false notion, and

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The Bible and the poems of Homer afford the only botanical facts known in the earlies ages af the world—Solomon is said to have spoken of trees and other plants—The Magi—Philosophers of Greece—

admitting that the only sure method of learing nature was to study her works, that the labours of philosophers began to be followed by important discoveries.

The greater part of the ancient Greek philosophers asserted, that plants were organized like animals, that they possessed sensible and rational souls, capable of desires and fears, pleasure and pain. Pythagoras of Samos, who travelled in Egypt, and was there instructed by the priests of the goddess Isis, is said by Pliny to have been the first of the Greek writers who composed a treatise on the properties of plants.

Seven men of the name of Hippocrates, wrote upon the medicinal properties of plants; but their descriptions, being destitute of system, are vague and cannot be applied to plants with any degree of certainty.

Aristotle, perceiving that that the course taken by preceding philosophers had not conducted them to the true knowledge of things, partially renounced their false ideas, and rested more upon observation and experience. In his researches he was favoured by Alexander of whom he had been the preceptor. That conqueror, in the midst of pride and the fury of passion, still possessed the love of true glory, and a desire that his conquests might serve to promote the improvement of the human mind; he allowed to Aristotle, in the prosecution of his scientific investigations, every facility that wealth and power could bestow.

Aristotle believed, that in nature there was a regular progress, from inorganized matter upwards to man, and from man upwards to the Deity; that beings were connected together by certain affinities, composing an immense chain of which the links were all connected. Thompson seems to have had this idea in his mind when he wrote thus:

"And lives the man whose universal eye
Has swept at once the unbounded scheme of things?
Has any seen
The mighty chain of beings, lessening down
From infinite perfection to the brink
Of dreary nothing, desolate abyss!"

This idea of a regular chain of beings, presenting itself with such grandeur and simplicity, has had many admirers; but facts do not always seem to correspond with this theory. In the vegetable kingdom we should find it impossible to trace a regular gradation from the oak to a moss, (if we were to make these the extremes of the chain of vegetable substances,) and say exactly in what part of the scale each family of plants should be

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Pythagoras—Hippocrates—Aristotle—

placed; it would rather seem in many cases, as if the links of the chain had been broken or disunited.

Aristotle considered plants as intermediate between inorganized matter and animals. Plants, he said, are not distinguished from animals in being destitute of the seat of life, the heart; because of this, the reptiles and inferior order of animals are also destitute. Plants have no consciousness of themselves, or organs of sense to know what is out of themselves; animals possess these faculties, therefore Aristotle says they are different. We think it would have been difficult for him to have discovered any evidence of consciousness in the sponge, or any marks by which it might appear that this animal substance (for such it is thought to be,) has any knowledge of any thing external to itself. However great may be the veneration entertained for the opinions of Aristotle, we believe his distinction between plants and animals will at this time find no supporters. This philosopher published his works on natural history about 384 years before Christ.

Theophrastus, the friend and pupil of Aristotle, published a great number of learned works; among others "*A History of Plants*," and "*The Causes of Vegetation.*" He treated separately of *aquatic* plants, of *parasites*, of *culinary herbs*, and of *flowering plants;* he remarked upon the uses of each plant, the place where it grew, and whether it was woody or herbaceous. He had no idea of genera or species; his names were merely local, and his descriptions generally indefinite. His views upon the *Physiology of plants*, were superior to his *descriptions* of them; he remarked upon their different external organs; distinguished the seed lobes, (Cotyledons,) from the leaves; gave just ideas upon their functions, and upon the offices of the root. He explained their *anatomy*, as well as possible, without the assistance of the microscope, which, (as the science of optics was then unknown,) had not been invented. Theophrastus seemed too much inclined to compare the structure of vegetables to that of animals; imagining that he found in plants, bones, veins and arteries.

A physician of Greek extraction, Dioscorides, travelled over Greece, Asia Minor and Italy, in order to observe the plants of those countries; his works were written in Greek; he divided plants into four classes, viz: 1st, *aromatic*, 2d, *vinous*, 3d, *medicinal*, and 4th, *alimentary or nutritious.* The labors of this botanist were of little value, in after times, on account of want of method in his descriptions. He gave the names and properties of 600 plants, but having no idea of species or genera, his work was but a chaos of facts, which were so imperfectly expressed as to render it impossible to apply them to use.

Theophrastus—Dioscorides—

The elder Pliny, who lived in the reign of Nero, treated of the history of plants, but he neglected nature and derived his science from the works of his predecessors. False systems of philosophy seemed to fetter the noblest minds, and prevent their pursuing those methods of investigation which would have led to a true knowledge of nature. The genius of Pliny was vast and active; he consecrated to scientific researches and literary works, the leisure which public duties left him. His "*History of the World*," which was a compilation of all the knowledge of the ancients, upon the subject of natural history, the only one of his writings which has escaped the ravages of time and barbarians, is but a small portion of his labors. He is considered faulty in recording both truths and errors, often transmitting them without observation or criticism, and sometimes favoring absurd traditions; but his work is justly admired for the greatness of its plan, which embraced the whole of nature, for the elegance of its style, for the wonderful art with which the highest considerations of practical philosophy are associated with natural history.

In the year 79 after Christ, Pliny fell a sacrifice to his desire of knowledge; in an eruption of Mount Vesuvius, wishing to contemplate as near as possible so sublime a spectacle, he perished, suffocated by the sulphureous exhalations.

Galen in the 2d century wrote upon the medicinal qualities of plants, but gave no descriptions. The love of the sciences, seemed in the prosperous days of Rome, to be extinguished; the "Mistress of the world," corrupted by victories, and by tyrants, had abandoned herself to luxury. The false philosophy of the vanquished Greeks reigned in the schools of victorious Rome, chasing away every trace of true knowledge. Religious fanaticism had also its influence; Christians and Pagans destroyed libraries, and the monuments of literature sacred and profane.

At this time the barbarians of the north and west, precipitated themselves upon a country weakened by effeminacy. Italy ravaged by the Huns and the Vandals, became successively the prey of the Heruli, of the Goths and Vandals. These people, nursed in war, abhorred the sciences and arts, believing they enervated courage, and they allowed not their children to cultivate them.

The Latin ceased to be the common language, but a corrupt mixture of barbarous languages took its place; the population was greatly diminished; the country formerly fertile and cultivated became sickly marshes and overgrown forests, inhabited by wild beasts.

Pliny—Galen—The false philosophy of the Greeks received at Rome—Barbarians ravage Italy—Language corrupted—

In this dark period botany shared the fate of the other sciences. The monks, strangers to the first elements of literature, and yet passing for the lights of their age, spoke in a barbarous language of the plants of Theophrastus and Pliny, commented upon writings they were incapable of comprehending, and mingled with their errors respecting facts, the most shameful superstitions.

LECTURE XLIV.

History of Botany, from the eighth century to the discovery of America.

The state of science was thus gloomy in the empire of the West, when Charlemagne, a monarch endowed with a genius for learning and civilization, in a barbarous age, vainly endeavoured to relight the torch of human knowledge.

The renown of Charlemagne extended to Asia; he entered into a correspondence with the famous Caliph of the Saracens, Haroun Alraschid, a man who greatly contributed towards polishing and enlightening the Arabians, and who preferred the friendship of the king of France to that of all the princes of Europe; for none like Charlemagne possessed a desire for intellectual greatness.

After the death of Charlemagne, which took place in the year 814, Europe became involved in still greater mental darkness than before.

On the separation of the Roman Empire into the Eastern and Western Empires, and the latter, weakened by luxury and effeminacy, had fallen an easy prey into the hands of barbarians, the Empire of the east, though feeble, yet preserved the precious deposits of ancient literature; but the greater part of the learned, occupied with the subtleties of scholastic theology, made no effort to enlarge the boundaries of natural science. Religious intolerance drove from the empire many enlightened men, who banished by the emperor Theodosius, carried among the Arabs the taste for Greek and Latin literature, and founded schools upon the shores of the Euphrates, where they taught rhetoric, languages and medicine.

The Arabs, fond of mysteries, and led by their genius and ardent imaginations, to the cultivation of poetry and works of

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Botany shared the fate of other sciences.

Charlemagne—Separation of the Roman Empire: its effects upon literature—the Arabs.

fiction, seemed to have little taste for sciences which required assiduous application, and patient investigation. Under Mahomet, urged on by fanaticism, they were the conquerors and scourges of the civilized world. Alexandria experienced their ruthless violence; this city, by turns the asylum and the tomb of letters, had witnessed, under the first of the Cæsars, the destruction of the library collected by the Ptolemies; under Aurelian, that founded by Augustus; under Theodosius, that which Antony had given to Cleopatra; and for the fourth time in possession of an immense collection of books, acquired through her love for philosophy, this city saw her magnificent library reduced to ashes by the victorious Saracens.

This barbarous but noble race at length became imbued with the love of science; a succession of caliphs, (among whom was Haroun Alraschid, already spoken of as the friend of Charlemagne,) by their devotion to learning, rendered Bagdad the most enlightened city of the earth. Their learned men began to construct maps of conquered countries, and to describe objects of natural history; distant voyages extended and multiplied their commercial relations; and mathematics, medicine, and natural history, were cultivated with ardour.

When the Arabs had conquered Spain, they carried thither letters and arts, and their schools became celebrated throughout the world. In the 11th century the French, Italians, Germans and English, went to them to learn the elements of science. The Arabians preserved their superiority in the sciences, at least, if not in literature, until towards the close of the 15th century. But when this people, divested gradually of their European conquests, were at last driven from Spain into Africa, they seemed, as if by instinct, to repluuge into the savage ignorance from which they had been drawn by the efforts of a few great minds.

The Arabs had considered plants more as physicians and agriculturalists, than as botanists; but although their descriptions of plants were imperfect, their labors were not useless to botanical science. They discovered many plants of Persia, India, and China, which were unknown to the ancients. They, however, fell into the error of dwelling more upon the works of Aristotle, Theophrastus, Dioscorides, and Pliny, than of observing nature: almost believing, nature herself must be wrong, when she deviated from those celebrated philosophers.

The *Crusades*, commencing at the close of the 11th century, and continuing until towards the middle of the 13th, prove the

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Haroun Alraschid—Schools of Arabs in Spain—Their labors of some use to botanical science—Crusades.

barbarity of the times; yet we cannot doubt, that these distant and romantic expeditions were suggested by the desire of change, and the vague wish to see and to know new things; and hastened the awakening of the human mind from its long sleep of ages.

The 12th and 13th centuries, witnessed in Italy the revival of a taste for letters and the fine arts; the commerce of that country was flourishing, the people made long voyages by sea, and in the relations which they published, spoke of the vegetable productions of the countries they had visited, in such a manner as excited the curiosity of the nations of Europe.

About this period, it is supposed, herbariums, or collections of dried plants, began to be prepared. This was an important era in botanical science; for nature is ever true, and incapable of leading into error, while descriptions, or even drawings may often give false views of natural objects.

The science of botany, was not enriched by a single work of any merit, from the fall of the Roman Empire, a period which marked the decay of literature, until the 15th century. Those, in the dark ages, who pretended to any knowledge of plants, only quoted from the Greek and Roman writers, but they were ignorant even of the principles of the languages in which their works were written. In the 15th century Italy was governed by wise princes, who were influenced by a desire to promote knowledge among their people. They invited to their country learned men from Greece, from whom they might learn the language of Homer and Aristotle.

At this time the Turks threatened Constantinople, and that capital of the empire of the East at length fell into their hands. The literature of Greece now took refuge in Italy; the ancient languages were revived, and at this time translations of ancient writers, with learned commentaries, were given. But these labors, although exercising an important influence upon literature, were not equally fortunate with respect to the progress of natural history. The learned writings of antiquity were accurately studied, but blinded by the brilliancy of great names, men of learning looked not upon nature; they had yet to learn, that without examining and comparing real objects, there can be no solid foundation in natural history.

At the period of which we are now speaking, a physician of Germany, published some indifferent descriptions of plants accompanied by a few engravings; this connexion of drawing and botany, although the whole was badly executed, was considered as an important improvement in the science.

Revival of literature—Herbariums composed—Constantinople taken by the Turks, and the literature of Greece transferred to Italy.

While Italy was thus a second time, enriched with the literary treasures of Greece, Spain and Portugal were becoming enlightened by intercourse with foreign nations. The Portuguese extended their voyages to the western coasts of Africa, and the Cape de Verd islands; the Cape of Good Hope was at length discovered, and Vasco de Gama sailing around this cape reached the East indies. It was at this period that Christopher Columbus, discovered the NEW WORLD.

This event, so important to the old world, is to us who inhabit this pleasant and favored country, one of deep interest. Ages upon ages passed on after the world was created, and America remained with regard to the Eastern continent as though she existed not. The lofty Andes raised their snowy heads to the clouds, the majestic Amazon rolled onwards to the Atlantic, our lakes spread out their vast expanse of waters, our own Hudson and Connecticut received their tributary streams, and bore them to the ocean; but to what people were these grandeurs presented, and what had been the changes in the moral world, while nature had moved on in her unchanging course? History is silent! But while in the old world empires had been rising, continuing for centuries stationary, and then decaying; succeeded and succeeded by others pursuing the same track: were no changes going on in the American continent? Had no mighty nations ever existed, had no arts or letters been cultivated, had the savage Indian for thousands of years, been sole lord of one half of the world, and when and how, did the first inhabitants of this continent come from Asia, where man was placed at his creation? These are inquiries which naturally arise on tracing the historic page through so long a period of time, until suddenly this new world bursts upon our vision! but, although many speculations have from time to time appeared, respecting the probable history of America, all until its discovery by Columbus remains a sealed book.

LECTURE XLV.

History of Botany, from the beginning of the sixteenth century to the time of Linnæus.

We have now traced the progress of botanical knowledge from the earliest periods of the world to the discovery of Ame-

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New World discovered—What was the history of America before this period.

nica. About this time Botanic gardens began to be cultivated: these afforded new opportunities for investigation, by comprehending within such limits, vegetables of all countries, as enabled the botanist to compare them, and to watch them in their growth and different states of developement.

From the days of Theophrastus until this period, botany instead of becoming more perfect had been rendered more obscure. This was not owing to want of attention or labour, but to the false rules of philosophy which had so long prevailed.

At length the cause of the evil seemed to be discovered. Many writers protested against the erroneous opinions of their times; they said, our blind respect for the ancients is an insurmountable obstacle to the progress of botany. We expect to find every where the plants of Theophrastus, Dioscorides, and Pliny; whereas they did not know one hundredth part of the plants which cover the globe. The first of them never went out of Greece; the second left only unconnected notes, treating without order upon the medicinal qualities of plants; and Pliny copied these notes without comment or criticism. We cannot apply to the plants of Germany or France the names under which the ancients described those of Italy, Greece, and Asia. before studying the plants of foreign countries, we ought to know those of our own. Of what use are disputes about the nature and qualities of species, when we are not able to distinguish one from another.

These reflections led to a happy revolution, not only in this science, but in all others; it may be called the era of true philosophy.* Although the principles, which were now discovered, were not much applied until the time of Bacon, Newton, Linnæus and Locke, perhaps never so perfectly applied in inquiries into the nature of the *mind* as in the present century by Brown.

Up to the period of which we are now speaking, plants had only been described in alphabetical order; about this time some German botanists attempted something like a collection of plants into species; this improvement was received with much approbation.

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* Lord Bacon is generally considered as having first taught the proper method of studying the sciences, viz: by ascending from facts to principles; this is called the method of induction. It has recently been asserted by an able writer in one of our first American periodicals, that Bacon was not the author of the inductive philosphy, but that he borrowed his rules of philosophizing from Aristotle, whose real principles had for ages been misunderstood. It is to be hoped that men of talents will not so far depart from the true rules of philosophizing, as to devote that time in contending about the author of these rules, which might be so much more profitably employed in their application to the investigation of truth and nature.

Botanic gardens first cultivated—Botanists began to discover the obstacle to the progress of the science.—Era of true philosophy.

We are at this time presented with the names of many who were engaged in examining and describing plants; among them we find little to distinguish one above the others. Some are commemorated by the names of plants; Leonard Fusch of Germany, by the plant Fuschsia; Lobel, physician to James I. by the Lobelia; and Lonicer by the Lonicera.

But, notwithstanding the labours of many learned men, little real improvement would have been made in the science of botany, had there not, at that time, existed some minds of superior genius, who turned their attention to tracing some proper method of classification. The names most illustrious in the annals of botanical science which here present themselves, are Gesner, Clusius, Cœsalpinus, and Bauhin; of the latter name were two brothers, both of whom are deservedly celebrated.

Gesner, a native of Switzerland, born in 1516, was of obscure and humble origin, but possessed of a powerful and penetrating mind.

He attempted to make a general collection of the objects of Natural History; he explored the Alps, and discovered many plants until then unknown. He is distinguished from those who had gone before him, in his suggestions that there existed in the vegetable kingdom groups or genera, each one composed of many species, united by similar characters of the flower and fruit. Soon after the publication of this opinion, botanists began to understand that the different families of plants have among themselves natural relations, founded upon resemblances and affinities, and that the most obvious are not always the most important. These are fundamental truths; and the distinction of species, the establishment of genera, and of natural families, seemed to follow of course after these principles were once established.

Clusius was born a few years later than Gesner; his parents had destined him for the profession of the law, but his decided taste for botany induced him to abandon this profession. He was learned in the ancient and modern languages, but his enthusiasm for natural history induced him to lay aside every other pursuit. He travelled over almost all the west of Europe, in order to make discoveries in the vegetable kingdom; he soon excelled all the botanists of the age in the knowledge both of native plants and exotics. He had the direction of the imperial garden at Vienna, and afterwards was a public professor of botany at Leyden. His passion for the study of plants was not enfeebled by age or infirmities; his enthusiasm in this science

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German and other botanists—most celebrated—Gesner,—How distinguished from his predecessors—Clusius—the first who proposed to divide plants into classes.

terminated only with his life. Before his time the art of describing plants with precision and accuracy was unknown; but his descriptions were neither faulty from superfluous terms, nor from the omission of important circumstances. He was the first who proposed to divide plants into classes.

Cœsalpinus, a native of Florence, who was contemporary with Clusius, proposed to form species into classes. The characters which he employed for this purpose, were the *duration* and *size* of *plants*, *presence* or *absence* of *flowers*, the *situation of the seed*, the *number of cells* in the fruit, and the *number of seeds* which they contained, the *adherence* of the *calyx* to the *germ*, and the *nature of the root*, whether *bulbous* or *fibrous*. This method was too imperfect to be followed, having neither the simplicity or the unity to render its application useful.

John Bauhin, though younger than Gesner, was his friend and pupil; he composed a general history of plants; this was a work evincing great learning and accurate investigation. Gaspard Bauhin, the younger brother, no less active and learned, and endowed with a still more penetrating genius, conceived the design of a work which should contain a history of all known plants, together with the different names which other writers had applied to the same plant. Clusius and the elder Bauhin had imagined something like a genus of plants, formed by a group of similar species, but Gaspard Bauhin expressed this more decidedly in remarks upon generic distinctions; his work, which was the result of forty years' labour, is said to have been of great assistance to Linnæus, in perfecting our present system of botany.

The 17th century, in its commencement, was not favorable to the sciences. Europe was agitated by continual wars, and the arts of peace were neglected; but in the last part of that age, the taste for natural history revived; men of highly gifted minds applied themselves to the study of botany, and many undertook long voyages with the only design of examining foreign plants. Botanists were astonished with the great number of interesting plants discovered by travellers in the region of South Africa, around the Cape of Good Hope, and in the East India Islands.

At this period the plants of our own country began to excite the curiosity of scientific Europeans. Among the number of voyagers to America, was a Roman Catholic priest, Plumier, celebrated for his mathematical and botanical knowledge; he

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Cœsalpinus—characters employed by him in the formation of classes—The Bauhins—Commencement of the 17th century not favorable to the sciences—Last part of that age, taste for Natural History revived.

made three voyages, and gave drawings and descriptions of more American species than any other traveller had done.

We now find the names of many who were distinguished by their efforts in the cause of science, but a notice of each individual would carry us beyond our limits, and prevent that clear conception of the state of the science, which the statements of a few conspicuous facts may produce.

Botanists now began to pay some attention to the stamens and pistils of plants; it was suggested that the science would remain imperfect as long as species and genera were undefined; orders and classes also were recommended. Natural resemblances and affinities were studied. A work was written upon the umbelliferous plants; it was the first attempt at describing in one mass, any single group of plants by characters peculiar to the whole. This was followed by several attempts to form a natural method of classification; among the most approved of these methods was that of Ray, who published a work called "*A General History* of Plants;" in this he divided all plants into 33 classes, 27 of which were composed of *herbs*, the rest of *trees.*

The first botanist who thought of classing plants without any reference to their being either herbs or trees, was a German, of the name of Rivinius, who proposed to consider as the foundation, of classification, the *absence* or *presence* of *flowers;* the *manner in which they were situated*, or their *inflorescence;* the *number of petals;* and the *regular* or *irregular form of the corolla.*

A botanist of the name of Magnol, at this time was honored by having his name given to the splendid Magnolia, an American plant, which then began to be known in Europe.

The method published by Tournefort, of France, which has been explained in another department of our subject, was published about the year 1700. While very young, the author of this method discovered an enthusiastic fondness for botanical pursuits; he had been destined, by his friends, for a profession; but his genius seemed so strongly bent upon the study of nature, that he was at length permitted to indulge without restraint in his favourite pursuits. He ranged over the Alps and Pyrenees, and many provinces of France, collecting the flowery treasures offered by those fertile regions; often in peril from banditti, and exposing his life to hazards in climbing terrific precipices, or amidst the glaciers of the mountains.

The method of Tournefort, which was founded upon the form of the corolla, although imperfect, greatly assisted the progress

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Many now distinguished for efforts in the cause of science—Several improvements in Botanical science—Rivinius—Magnol—Tournefort.

of *that botanist* who stands first on the catalogue of the laborers in this department of Natural History. You do not need to be told that we here refer to Linnæus.

You will observe that the attempts of botanists had been hitherto chiefly directed towards the attainment of some proper method for the arrangement of plants; the attention of some investigating minds was now turned towards their *Anatomy and Physiology.* Since the days of the first Greek naturalists, these departments of botanical science had lain neglected; but now the confused opinions of the ancients served to suggest experiments and observations, which resulted in solid discoveries.

The invention of the microscope threw light upon the mysteries of nature, which, without the invention of this instrument, must ever have remained in obscurity; by its assistance botanists studied the internal structure of vegetables; they described the *heart*, *wood*, and *pith*; they perceived the new formed bud, yet invisible to the naked eye; the future plant existing in the bulbous roots, and even in the seed; pores were discovered, which were found to be the organs of the expiration and inspiration of gasses, thrown out as noxious, or inhaled as nutritious. The importance of the stamens and pistils as essential to the perfection of the seed of vegetables began to be suggested.

As yet however, the science of botany lay in scattered fragments of various imperfect and contending systems: much labor had been bestowed, and great improvements made, but there seemed to be no central point around which these improvements might be collected; the learned world were sensible of the deficiency; but it required great genius, great observation of nature, and courage to stem the tide of popular prejudices, in any one who should come forward to attempt the work of reform.

Charles Linnæus, an inhabitant of Sweden, suddenly emerging from obscurity, offered to the world a system of botany, so far superior to all others, as to leave no room for dispute as to its comparative merit. All preceding systems were immediately laid aside, and the classification of Linnæus was received with scarcely a dissenting voice. What this system was, you have not now to learn, since it has been the basis of your botanical studies. Linnæus extended the principles of his classification to the animal and mineral kingdoms; in the language of an eminent botanist,* " His magic pen turned the wilds of Lapland into fairy fields, and the animals of Sweden came to be classed by him as they went to Adam in the garden of Eden to receive each his particular name."

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* Sir James E. Smith.

Attention of botanists turned towards anatomy and physiology—Invention of the microscope—Science of botany yet imperfect—Linnæus.

LECTURE XLVI.

History of Botany from the time of Linnæus, to the present.

Linnæus was born in 1707; his father was a clergyman, and had designed his son for the same sacred office; but seeing him leave his studies to gather flowers, he inferred that he possessed a weak and trifling mind, unfit for close investigation, and was about to put him to a mechanical employment; when some discerning persons perceiving in his devotion to the works of nature, the germ of a great and lofty mind, placed him in a situation favorable to the developement of his peculiar talents, where he was allowed without restraint, to study the book of nature, "This elder Scripture, writ by God's own hand."

Linnæus formed anew the language of botanical science; every organ of the plant he defined with precision, and gave it an appropriate name; every important modification was designated by a particular term. Thus comparisons became easy, and confusion was avoided. The characters of plants appeared in a new light. Each species took, besides the name of the genus to which it belonged, a specific name which recalled some peculiarity distinctive of the species. Before that time the species, instead of being thus named, required in some cases a whole sentence to express the name.

But what rendered the works of Linnæus most popular, was his artificial system, in which he had made the stamens and pistils subservient to a most simple and clear arrangement; he remarked the *different insertions of the stamens; their union by means of their filaments had been before observed, but he employed them in a manner entirely original.*

This "*Northern Light*," as he has sometimes been termed, contributed to the progress of physiology by his own discoveries, and by improving upon the suggestions of those who had gone before him.

In the details of science, he was no less accurate, than bold and comprehensive in his general views. The world knew not which to admire the most, the multiplicity, the novelty, or the profound views of this modern Aristotle. His school became the resort of men of science from all Europe; and he seemed to have acquired that influence over the human mind, which had been peculiar to the ancient philosophers of Greece.

The defects of this great man, for human nature is never without its imperfections, were, that he sometimes carried too

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Improvements made by Linnæus.

far a favorite idea; endowed with a brilliant imagination, he was at times somewhat blinded by the beauty of his own conceptions, and strove to reconcile nature to the visions of his own fancy.

We have, in our investigations of the artificial system occasionally pointed out in it some imperfections, particularly in the separation of natural families; but no means of remedying these have yet been found, and we still, after the lapse of near a century, with the exception of a few alterations, receive this system as left by its author.

Linnæus died in 1778; ten years afterwards a society of naturalists, distinguished by his name, was founded in London; this society is now in possession of his library, herbariums, collections of insects and shells, with numerous manuscripts. Sir James Edward Smith was the founder of this society, and its first and only president until his death, which has recently occurred. He translated the writings of Linnæus, (which were originally in Latin,) and illustrated them by his own comments; no one, perhaps, has done more towards rendering botanical science accessible to all classes of people than this elegant writer.

The study of plants, after the discoveries and classifications of Linnæus, became, in a degree, general. The knowledge of vegetable physiology began to be usefully applied to agriculture. Duhamel of France very successfully laboured to exhibit the connexion between the science of botany and the cultivation of plants. Bossuet of Geneva proved by experiments that the vascular system of plants is tubular and transparent; and that leaves perform the office of respiration.

Grew of England ascertained the existence of the cambium, and Duhamel afterwards proved that it was distinct from the sap and proper juices. The latter opposed the idea till then entertained, that earth and water were the only food of plants; he proved that the various solids and fluids diffused in the soil and atmosphere, are all important to vegetation.

The observations of Priestly, Saussure, and others, aided by the discoveries made in pneumatic chemistry, of the existence of oxygen, hydrogen, and carbonic acid gases, formed a new era in the history of vegetable physiology. It was proved that vegetables do ultimately consist of oxygen, hydrogen, and carbon, and sometimes of a small quantity of nitrogen, combined with mineral salts, and often some silex, sulphur, and iron, which seem important to vegetable life. These elemetary substances were found to be diffused through the air and water, and the animal and vegetable substances which the latter holds in

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Linnæan Society in London.

solution; the green parts of vegetables were observed to exhale oxygen in the light, and carbonic acid gas in the dark; and the carbon left by the decomposition of the carbonic acid, was shown to be incorporated into the vegetable substance, giving to the wood its strength and hardness.

Bernard de Jussieu proposed a method of classing plants according to certain distinctions in the seed, which were found to be universal; this method was perfected and published by his nephew, Antoine-Laurent de Jussieu, and is now universally received as the best mode of natural classification which has yet been discovered.—We call this method natural, because it aims to bring into groups such genera of plants as resemble each other in medicinal and other properties, while the system of Linnæus is called artificial, because by a certain rule, plants are brought into groups which have no such resemblance in their properties. We therefore find in one of the Linnæan classes, the poisonous flag and the nutritious grass, the grain which supports life and the darnel which destroys it; in another the healthful potatoe and the poison mandrake, the deadly hemlock and the grateful coriander. We might thus go through this system and constantly meet with similar contrasts in the qualities of the plants which are here collected into the same classes. nor are their external appearances less unlike; for here the oleander and pigweed, the tulip and the dock meet in the same classes. This system it should always be remembered, is not the whole science of botany, but is the key to the natural method, by which alone we should find great difficulty in ascertaining the names of plants; it is, as it were, a stepping stone by which we must ascend to the valuable knowledge which cannot well be reached in any other way. The more practical a botanist becomes, the less need he has for this assistance; the eye becomes quick to seize on natural characters without reference to the dictionary, as the artificial system is aptly termed. Thus a pupil in studying a language may in time be able in a degree to dispense with his dictionary; but he could never have proceeded thus far without its assistance. For more particular explanations of Jussieu's method, you are referred to the comparison of that with the method of Linnæus and Tournefort in the remarks on classification.

Adanson, previous to the time of the younger Jussieu, had published a system of classification, in which he arranged plants according to the resemblance observed in all their organs. In one class all which had similar roots were placed; in another all which had similar stems; a third was arranged by resem-

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Jussieu's classification.

blance of leaves in their forms and situations; but the most important distinctions he considered as founded upon the organs of fructification.

Among other botanists we would notice L. C. Richard, who wrote in French an interesting account of the Orchideæ of Europe, and assisted in compiling from ancient works a very useful botanical dictionary.

Des Fontaines first shewed that the stems of monocotyledonous and of dicotyledonous plants, differ from each other in their structure, and modes of growth; he divided them into *endogenous*, growing inwardly, as the palms; and *exogenous*, growing outwardly as the oak.

France is distinguished for the number and accuracy of its naturalists. Mirbel, a distinguished professor of botany in Paris, has pursued his inquiries into the anatomical structure, and the physical operations of plants, to an extent not exceeded by any other philosopher. The Baron Humboldt spent five years in investigating the vegetable productions of the equatorial regions in America, and his remarks on vegetables, as a criterion of climate, are original and interesting.

Josephine the first wife of Napoleon was distinguished for her fondness for this study; other ladies of distinction stimulated by her example, cultivated plants with reference to scientific observations.

De Candolle is the author of a work called a Elementary Theory of Botany"; this is highly valued as a scientific and able performance; but it is useful rather for those who have already attained a knowledge of the elements of botany, than for the beginner in the science.

In turning from Europe to our own country, we find the state of literature highly flourishing, and a taste for the natural sciences, universally diffused. The names of many of our naturalists stand high in Europe, as well as in their own country.

Among these are Silliman, who established the first scientific journal,* and encouraged others to pursue the course of investigation which he himself has followed so successfully; and Eaton, who has indefatigably labored to bring science within the reach of every inquirer, by divesting it of the dress of foreign languages, and the parade of learning; not only rendering the labors of others of more general utility, but adding to the common stock, the result of years of inquiry and observation.

To go back to the infancy of science in the United States, we find the name of Bartram stands recorded in history, as that of the first native of our country who was conspicuous for botanical researches.

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* Except the Mineralogical Journal of Bruce which ceased after the appearance of a few numbers.

French Naturalists—American.

Houston investigated the region of Canada, and described many of its plants; in honor of him is named the little flower HOUSTONIA *cærulea.*

Clayton made a list of Virginian plants, and is commemorated in the beautiful CLAYTONIA *virginica.*

Kalm, a pupil of Linnæus, whose name is given to the KALMIA, (American laurel,) spent three years in America, and returned to Europe laden with botanical treasures; the sight of the American plants brought by his pupil, many of which were entirely new to him, is said to have produced such an effect upon Linnæus, that although lying ill of the gout, and unable to move, his spirits were rekindled, and in the delight of his mind he forgot his bodily anguish, and recovered from his disease.

Among the earliest botanists of North America, were Colden, Michaux, and Muhlenberg; Pursh was the first who furnished a system of North American plants, so arranged as to be useful to the student. Some of the first teachers of the science were Barton, Hosack and Mitchel. The first lecturer on Botany in the interior of North America, was Professor Amos Eaton. Dr. Bigelow gave a course of lectures in Boston, in the year 1813, and soon after published his Boston Flora.

Professor Ives and Dr. Tully did much in New England towards awakening a zeal for the science, in the years 1815 and 1816; and at a later period, Dr. Sumner has pursued and illustrated the study with much ardor and success.

Want of books was a great impediment to the progress of the science when Eaton published his Botanical Dictionary and Manual of Botany; this book gave a new impulse to the progress of the science; its familiar method, and simple style induced many to commence the study. This was followed by many other works describing plants, and several elementary works; of the former class were Nuttall's Genera, Elliott's Southern Plants, Barton's Flora of Philadelphia, Darlington's Torrey's, and Bigelow's Floras; these furnished descriptions of most American plants, not included in the works of Pursh. Among the Elementary works are "Barton's Elements," a large work containing much that is interesting in the physiology of plants; "Lock's Botany," a small book, but exhibiting a plan of arrangement simple and methodical; "Sumner's Compendium of Botany," written in a beautiful and pure style; and more recently, "Nuttall's Elementary Work," which gives in popular language more facts with regard to plants, than almost any

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American Naturalists.

other work of the kind. In all the books which we have enumerated, none have been designed as a full and connected course of botanical study. The publication of our present course of instruction, may perhaps, remove some obstacles which have hitherto impeded the progress of botanical information, particularly in schools and among our own sex. From some examples in our own class we see, that even children may become botanists, and lay aside their toys to divert themselves by distinguishing the organs of plants and tracing out their classification. A few years since, the science of Botany was confined almost wholly to those of the medical profession, now it is within the reach of all who can read the English language, and few indeed are the natives of our republic who are destitute of this qualification.

Of all sciences, perhaps no one is settled on a firmer foundation than that of botany; the improvements of future years, we are not able to anticipate; but it is probably that as discoveries and improvements are made, they will cluster around the principles already established; each taking its proper place in the various departments now arranged for the reception of scientific truths.

The spirit of our government is highly favorable to the promotion and dissemination of knowledge, and although Europe may boast of more brilliant stars than appear in our firmament of letters, shining with greater lustre, contrasted with the darkness and ignorance by which they are surrounded; we may justly feel a national pride in that more general diffusion of intellectual light, which is radiating from every part, and to every part of the American republic.

LECTURE XLVII.

GENERAL VIEW OF NATURE.

Organized and Inorganized Bodies—Classification of Animals.

Having considered the vegetable kingdom under its various aspects, it may be proper, before closing our course of botanical study, to take a general view of that external world of matter, of which the part we have examined, extended and diversified as it is, constitutes but a very small portion. The science you

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Study of botany within the reach of all. Definition of nature.—

have been investigating, with some others, constitutes a general branch of knowledge, termed *Natural science.* The study of nature presents in a lively and forcible manner, the power and wisdom of the creator; and offers to the enlightened mind, a never failing source of the most pure, and refined enjoyment. Those who know nothing of this source of happiness, cannot appreciate its value; they may inquire the use of studying into the nature of objects, without any reference to the enjoyment of the senses, to personal gain, or honor. A celebrated naturalist* observes; "The rich and the great imagine, that every one is miserable, and out of the world, who does not live as they do; but they are the persons who, living far from nature and from God, live out of the world. Misled by the prejudices of a faulty education, I have pursued a vain felicity amid the false glories of arms, the favor of the great, and sometimes in frivolous and dangerous pleasures. I have never been happy but when I trusted in God; opposed to THEE, the AUTHOR of all things! power is weakness! supported by THEE, weakness becomes strength! When the rude Northern blasts have ravaged the earth, THOU callest forth the feeblest of winds; at the sound of THY voice, the zephyr breathes, the verdure revives, the gentle cowslip and the humble violet cover the bosom of the bleak earth with a mantle of gold and purple."

To the pious reflections of this French writer we will add the following quotation from an English author,† the energies of whose rich and cultivated intellect were devoted to the cause of religion; who viewed nature as a philosopher, but what is far better, as a Christian. Happy indeed, are those in whom philosophy and christianity are blended, and delightful is the intercourse even in this world between minds thus enlightened and purified!

"There is peculiar sweetness in the recollection of those hours which we have spent with friends of a kindred spirit, amidst the beauties of created nature. The Christian can alone find that congeniality in associates, who not only possess a lively and cultivated sense of the high beauty which landscape scenery presents to the eye, but who can also see creation's God in every feature of the prospect. The painter can imitate, the poet describe, and the tourist talk with ecstacy of the sublime and beautiful objects which constitute the scene before him. But he can only be said to enjoy them aright, whose talents, taste, and affections are consecrated to the glory of *Him* by whom 'all things were made, and without whom was not any thing made that was made.' When the pencil that traces the rich and animated landscape of mountains, lakes and trees, is guided by a grateful heart as well as by a skilful hand; then the picture becomes no less an acceptable offering to God, than it is a source of well directed pleasure to the mind of man. And when the poet, in harmonious numbers, makes hill and dale responsive to his song, happy is it, if his soul be in unison with the harp of David, and if he can call on all created nature to join in one universal chorus of gratitude and praise. The christian traveller best enjoys scenes like these. In every wonder he sees the hand that made it—in every landscape, the beauty that adorns it—in rivers, fields and forests the Providence that ministers to the wants of man—in every surrounding object he sees an emblem of his own spiritual condition, himself a stranger and a pilgrim, journeying on through a country of wonders and beauties; alternately investigating, admiring, and praising the works of his Maker, and anticipating a holy and happy eternity to be spent in the Paradise of God, where the prospects are ever new, and the landscapes never fade from the sight!"

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* St. Pierre.

† Rev. Legh Richmond.

Natural science.

"O! for the expanded mind that soars on high,
Ranging afar with Meditation's eye!
That climbs the heights of yonder starry road,
Rising through nature up to nature's God.

O! for a soul to trace a Saviour's power,
In each sweet form that decks the blooming flower;
And as we wander such fair scenes among,
To make the Rose of Sharon all our song."

By the word *Nature*, derived from a term signifying born, or produced, in a general sense we mean all the works of God. Using a figure of speech called *Metonomy*, we often put the effect for the cause; as when we speak of the "works of nature," meaning what the Almighty has brought forth, or we often mean by nature the Deity himself: as when we say that nature produces plants and animals.

With respect to the heavenly bodies, which manifest themselves to us with so much magnificence, we know them to be matter, because we observe them to be subject to the laws which govern matter; and we have been able, by the discoveries of astronomers, to understand their various revolutions: we have in general clearer ideas of their motions than even of our own planet; it is more easy for us to imagine them as moving, than that our firm earth is whirling with inconceivable velocity. Were it possible for us to conceive the quantity of matter which

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Definition of Nature—The heavenly bodies.—

even one world as large as our sun contains, the thought would be overwhelming; and of all the worlds which we behold at one view in a serene night, what finite being could imagine their united extent? They are suspended over our heads, each one pursuing its destined course; why do we not fear that some one may be precipitated upon our little world, and crush it to atoms? It is because we know that they are all upheld by that Power which "created the heavens and the earth," and who governs the universe by regular laws. This universe is infinite as the God who formed it; our sun, with all its systems, is but a point lost in immensity. Astronomers have proved that the fixed stars are at such an immense distance from us, that moving at the rate of 500 miles an hour, we should not reach the nearest of them in 700,000 years, a distance more than 200,000 times greater than that of the sun from the earth. The same space probably separates all the fixed stars. Around those stars revolve millions of opaque globes, as our earth revolves around the sun, which is also one of the fixed stars. The satellites describe around the primary planets almost circular orbits; they are carried with their primaries around the sun in their annual motion; the sun himself, with all his numerous train of primary planets, each with their satellites, revolves around the common centre of gravity of the fixed stars, of which himself constitutes a part; and these are supposed to revolve around the centre of the universe. Here may be the throne of the Almighty Creator and Director of all these stupendous objects.

Yet we need not fear that we shall be forgotten in the immensity of creation; the same Being who created and rules the host of heaven, made the little moss and the lilies of the field, which are so beautifully arrayed. If God condescends to care for them, he will not neglect us who are made in his own image, and destined to an immortal existence.

Turning our thoughts from the heavenly host to our own little globe, and considering the matter which exists upon it, we find two great classes of substances: 1st, *inorganized*, and 2d, *organized*.

The 1st *class of substances*, viz: such as are *inorganized*, comprehends all matter destitute of a living principle; such as *fluids*, *gases*, and *minerals*. The particles which compose them are entirely subject to chemical and mechanical laws.

The 2d *class*, viz: *organized* substances, includes animals and vegetables; the particles constituting them are in a perpetual state of motion; they are supported by air and food, endowed with life, and subject to death; the active power or life which

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The heavenly bodies—All substances on the earth divided into two classes.

operates in them we call the *vital principle.* This vital principle eludes the researches of man; all that we know of it is in its effects, enabling the organized body to resist putrefaction, and, to a certain degree, to maintain a temperature different from surrounding bodies. Deprived of this vital principle, both animals and vegetables become subject to chemical decomposition; their solid parts are dissolved, and they return to the earth from whence they were taken.

If you dig up a stone, and remove it from one place to another, it will suffer no alteration; if you dig a plant it will wither and die. If you break a mineral to pieces, every fragment will be a perfect specimen of its kind, it will only be altered in shape and size; but if you tear off a branch from a plant, or if a limb is taken from an animal, they will both immediately begin to decay; the vital principle being extinguished, putrefaction and dissolution follow.

We should never have been able to predict, from the appearances of the stone, the plant, and animal, that they were thus differently constituted; by observations we find, that the production and mode of growth, has been under different circumstances. We find that the stone has grown by a gradual accumulation of particles, independent of each other, and can only be destroyed by chemical or mechanical force; the plant and animal, have on the contrary, grown by nourishment, been possessed of parts mutually dependent, and contributing to the existence of each other.

So far, our observation teaches us the distinction between organized and inorganized beings; though it does not teach us in what this internal power or life consists. God permits us to know much, in order to lead us to industry in the attainment of knowledge; but he places boundaries beyond which we may not pass, that we may be humble.

COMPARISON OF THE ORGANIC AND INORGANIC KINGDOMS.

INORGANIC BODIES.	ORGANIC BODIES.
Structure.	
Their parts always analogous to, and not depending on each other; thus a fragment of stone, is as much a stone as the block or rock to which it belonged.	Their parts are mutually dependent; thus a *stem*, leaf, flower, &c, do not constitute a vegetable being, except as they are united; it is the same with the different parts of an animal.

Distinction between inorganized and organized substances—

Origin.

Molecular attraction, modified by time and space, or by the art of man (as in chemistry); they are *made.*	Owe their existence to beings similar to themselves, produced either from eggs, or brought into existence in a living state; they are *hatched or born.*

Developement.

They grow by the addition of new particles; are hence, said to increase by *juxtaposition* or *accretion.*	They develope by assimilating to their nature, or converting to their sustenance, foreign substances which they absorb, or receive internally; they increase by *nourishment.*

Termination.

They are limited to no particular form (except in the case of crystals), they have no life, and are not subject to death; they *decompose.*	They have a determinate form, and duration; their existence terminates either by old age, or disease; they *die.*

Having considered the distinction between inorganic and organic substances, we will proceed to a division which may be more familiar to you; that by which the matter upon our globe is ranged under three kingdoms; the ANIMAL, VEGETABLE, and MINERAL.

We find it somewhat difficult to draw a line of distinction between the different kinds of organized beings, viz. animals and vegetables; the lines of distinction often seem to fade so gradually, that we cannot well decide where the animal ends, and the vegetable begins.

This difficulty may seem at first somewhat strange, as you may perhaps never have been at a loss to tell an animal from a vegetable; you would certainly know how to distinguish between a nightingale and a rose, or between an ox and an oak; but these are animals and vegetables in a comparatively perfect state.

The animal you see has the power to move about, to seek the nourishment most agreeable; you perceive it uttering audible sounds, possessing sensation and apparent consciousness. The plant on the contrary is confined to a particular spot, having no

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Difficult to draw a line of distinction between the two great classes of organized beings—

other nourishment than substances which themselves come in contact with it; exhibiting no consciousness, nor to common observation any sensation. It is only, when we examine with close attention, the various phenomena in the vegetable and animal kingdoms, that we learn to doubt, as to the exact boundaries by which they are separated.

The division of nature into three kingdoms, animal, vegetable and mineral, is very ancient, and appears at first to be clear and precise.

Minerals destitute of life increase by the accumulation of new particles.

Vegetables grow, produce seeds which contain the elements of future plants like themselves, and then die.

Animals unite to the properties of vegetables, the feeling of their own existence; or as Linnæus has said, "*Stones grow, vegetables grow* and *live, animals grow, live,* and *feel.*" Although this simple view of the works of creation is pleasing, it is not satisfactory; because we are not able to decide where in the vast series of organized beings, sensation ceases.

That you may the better understand what is meant by the gradations in animal life, we will present you with a sketch of the classification of animals. The study of this department of nature you have already been told is termed Zoology.

A very general and simple classification of animals is as follows:—

"Vertebral, animals having backbones.

Avertebral, animals destitute of backbones.

Vertebral animals are divided into,

1. *Quadrupeds.* The science of which has no popular name. It includes four-footed animals; as ox, dog, mouse.

2. *Birds.* The science of which is called *ornithology.* It includes the feathered tribe; as pigeon, goose, wren.

3. *Amphibious Animals.* The science of which is called *amphibiology.* It includes those cold-blooded animals which are capable of living on dry land, or in the water; as tortoise, lizard, serpent, frog.

4. *Fishes.* The science of which is called *itchthyology.* It includes all aquatic animals which have gills and fins; as shad. trout, sturgeon, eel.

Avertebral animals are divided into,

5. *Insects.* The science of which is called *entomology.* It includes all animals with jointed bodies, which have jointed limbs; as flies, spiders, lobsters.

6. *Vermes.* The science of which is called *herminthology.*

Obvious distinctions—Division of nature into three kingdoms—Zoology—Division of animals into two great classes—Division of vertebral animals into four classes—Division of avertebral animals into two classes.

It includes all soft animals of the avertebral division, which have no jointed limbs, with or without hard coverings; as angle worms, snails, oysters, polypi, and infusory animals."*

The system of Zoology most approved, is the one taught by Linnæus, with some improvements made by the great French naturalist, Cuvier; according to this mode of classsification, the animal kingdom is divided into four grand divisions, viz:—

VERTEBRAL, MOLLUSCOUS, ARTICULATED, and RADIATED. These are subdivided into classes and orders.

First Grand Division—Vertebral Animals.

CLASS I. *Mammalia*, or such as at first are nourished by milk. This class have lungs, and peculiar organs for imbibing their food, during their first stage of existence.

The *First Order* is called *Bi-mani*, (from *bis* two, *mani* hands;) this order includes *man* only; we find here no generic or specific differences, but the following varieties.

1st. *Caucasian* race, anciently inhabiting the country about the Caspian and Black Seas, from whom we are descended.

2d. The *Mongolian*, the ancient inhabitants about the Pacific Ocean, from whom the Chinese are descended.

3d. The *Ethiopian*, or Negro race.

The second order contains the *quadru-mani*, from *quatuor* four, and *mani* hands. These have thumbs, or toes separate, on each of the four feet. We here find Orang-outang, (sometimes called the wild-man,) and the Monkey.

The *Third Order* contains *Carnivorous* animals, or *flesh-feeders*, having no separate thumbs, or great toes without nails; as the Dog and Cat.

The *Fourth Order* contains the *Gnawers*, having no canine teeth, (those which are called eye-teeth,) feeding almost wholly on vegetable substances; as the Rat and Squirrel.

The *Fifth Order* is *Edentata*, or animals *wanting teeth;* as the Sloth and Armadillo.

The *Sixth Order*, *Pachyderma*, thick skin animals with hoofs; as the Elephant, Horse, and Hog.

The *Seventh Order* contains the *Ruminating* animals, such as chew the cud, having front teeth (incisors) below only, and feet with hoofs cloven, or divided; as the Ox, Sheep, and Camel.

The *Eighth Order*, *Cete*, contains aquatic animals, (such as live in water,) having no kind of feet, or whose feet are fin-like-limbs; as the Whale and Dolphin.

We have enumerated all the orders of the class Mammalia, as it is the one in which man is placed; we shall now notice the remaining classes of animals, without going into so minute a detail of their orders.

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* Eaton's Zoology.

Cuvier's four grand divisions—First division containing four classes—

Class ii, Contains *Birds*, (*Aves*,) which are distinguished by having the body covered with feathers and down, long naked jaws, two wings formed for flight, and bi-ped (from *bis* two, and *pedes* feet.) The orders in this class, are chiefly distinguished from each other by the peculiar make of the bill and feet.

Class iii, *Amphibia*, contains amphibious animals, including what are commonly called *reptiles*. It is divided into four orders:

1st. With shells over their back, and four feet; as the tortoise and turtle.

2d. Covered with scales, and having four feet; as the crocodile and lizard.

3d. Body naked, destitute of feet; as serpents and snakes.

4th. The body naked, and having two, or four feet; as the frog and toad.

Class iv. Contains *Fishes*, (*Pisces*,) natives of the water, unable to exist for any length of time out of it; swift in their motions, and voracious in their appetites; breathing by means of gills, which are generally united in a long arch; swimming by means of radiate fins, and mostly covered with scales.

Second Grand Division.

Class v. *Mollusca*, bodies soft, without bones, but their muscles attached to a skin which forms a calcareous covering called a shell, and is in many cases, produced from their skin. These animals possess no organs of sense but those of taste and sight, and these are often wanting; the nautilus and cuttle fish are of the highest order of Molluscous animals.

One order contains animals without heads, having a shell usually of two pieces; these are called *bi'valves*; as the oyster, clam, and snail.

Third Grand Division.

We proceed next to those *animals called Articulated*; these have jointed trunks, and mostly jointed limbs. They possess the faculties of changing place, (locomotion;) some have feet and others are destitute of them, moving by trailing along their bodies.

Class vi. *Annelida*, contains such animals as have red blood, without a bony skeleton; bodies soft and long, covering divided into tranverse rings, living mostly in water; some of them secrete calcareous matter which forms a hard covering, or shell; as the earth, or angle worm, and leech.

Second division containing one class—Third division containing four classes.

Class vii, *Crustacea*, contains animals without blood, with jointed limbs fastened to a calcareous *crust;* they breathe by a kind of gills.

Class viii, *Archnida*, contains spider like animals without blood, jointed limbs, without horns; they breathe by little openings, which lead to organs resembling lungs, or by little pipes distributed over the whole body; these do not pass through any important change of state as insects do; they have mostly six or eight eyes, and eight feet, and feed chiefly on living animals; examples of this class are the spider and scorpion.

Class ix, *Insecta*, or insects, without blood, having jointed limbs and horns; they breathe by two pipes, running parallel to each other, through the whole body; they have two horns; they are mostly winged, having one or two pairs, a few are without wings; mostly with six feet. They possess all the senses which belong to any class of animals, except that of hearing. The winged insects pass through several changes or metamorphoses.

The Butterfly is first an *egg;* this when hatched is long and cylindrical, and divided into numerous rings, having many short legs, jaws, and several small eyes; this is the *larvar* commonly called caterpillar. At length it casts off its skin and appears in another form without limbs. It neither takes nourishment, moves, nor gives any signs of life; this is called *chrys'alis.* At length, by examining it closely, the imperfect form of the butterfly may be seen through the envelope; this it soon bursts, and a *perfect butterfly* appears. When about to pass into the chrys'alis state, of which they appear to have warning, the insect selects some place where it may repose safely during its temporary death.* The silk worm spins its silken web to wrap itself in, and this web is that, from which all our silks are made.

Fourth Grand Division.—Radiated Animals.

Class x. *Zo'ophites*, or animal plants. Here we find the lowest beings in the animal kingdom. Some of the orders of this class contain animals which have neither heart, brains, nerves, nor any apparent means of breathing. These are sometimes called animal plants; many of them, as the *corals*, are fixed to rocks and never change place; others, as the *sea-anemone*, grow upon rocks, having a kind of stem, like a flower; some are attached by a kind of root to the bottom of the sea;

* May not this be considered as a lesson to man to anticipate and provide for the change in his existence, which his bodily infirmities, and his daily observation, teach him is to be his own lot.

Metamorphoses of insects—Fourth division containing one class.

some, as the *sea-nettle*, which appears like the segment of a circle, are carried about by the motion of the waters, without any voluntary motion; among these are the sea-daisy, the sea-marygold, and the sea carnation, so named from an apparent resemblance to those plants. We find here the *sea-fan*, the *sea-pen*, and the *Madrepore*, the latter of which are often thrown together in such quantities, as to form islands of coral, and to block up the entrance into harbors. The sponge also belongs to this class of strange animal substances; this consists of a fibrous mass, which, when fresh, contains a kind of substance like jelly, which discovers a slight sensation when touched; this is the only sign of life which it manifests.

These animals resemble plants in their manner of producing others; they form a species of germ, like the bud growing upon the stalk, this falls off from the stem, and becomes a perfect animal. If a part of one of those animals is separated from the rest, it will itself, be as perfect a living animal as was the whole before. A polypus can be divided into as many animals as it contains atoms; some of this order are very properly called hydras, (many headed.) Besides these, there is another order of animal substances, *infusoria*, which appear like a homogeneous mass, having no appearance of any limbs whatever; these are either angular, oval, or globular.

After this examination of the animal kingdom, we are prepared to return to the consideration of the distinction between vegetables and animals. You now perceive that although you might have no hesitation to determine which was animal and which vegetable between a nightingale and a rose, that between a polypus or coral, and a mushroom or a collection of mould, it would be somewhat difficult to fix upon any distinctive characters, which should place the two first in the animal, and the two last in the vegetable kingdom.

LECTURE XLVIII.

Man at the head of the Kingdoms of Nature.—Comparison between Animals and Plants.—Conclusion.

In our last lecture, after a glance upward to the heavenly bodies, we returned to our globe, and considered its various substances; here we found two classes of bodies, inorganized and organized substances; the former including minerals, the latter

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Recapitulation.

embracing the animal and vegetable kingdoms. We then took a brief view of the animal creation.

At the head of the animal kingdom, we found man, sufficiently resembling brute animals in his material frame to constitute a part of an extensive class, embracing the ape, the elephant, and the dog; yet between the lowest degree of intelligence in the human race, and the highest faculties of brutes, there is a line of distinction marked by the hand of the Almighty, in characters too obvious for doubt. God said "let us make man in our own image, and he breathed into him the breath of life, and man became a living *soul.*"

Some writers have attempted to show that man differs only from the inferior order of animals in possessing a greater variety of instincts.* But however wonderful may appear the *instinctive perceptions* of brutes, they are destitute of reason, and incapable of being the subjects of moral government; we must, therefore, both from our own observation, and the declarations of scripture, infer, that the faculties of man differ not in *degree* only, but distinctly *in their nature*, from those of all other beings upon our globe.

Man, (says Buffon,) by his form and the perfection of his organs, and as the only being on earth endowed with reason, seems properly placed at the head of the kingdoms of nature. All in man announces him the lord of the earth; his form marks his superiority over all living beings; he stands erect, in the attitude of command, he can gaze upon the heavens; on his face is imprinted the character of dignity; the image of his soul is painted upon his features, and the excellence of his nature penetrates through his material organs, and animates the expression of his countenance.

In the orders of animals next to man, we find the external senses of sight, touch, taste, and smell equally perfect as those possessed by him, and, in some cases, they are even more acute; but as we proceed downwards through the gradations of animal existence, we perceive the number and acuteness of the senses to diminish; we find some beings with but four senses, others with three, with two, and lastly in the Zoophites, with only a sensibility to touch, and that so faintly exhibited as almost to lead us to doubt its existence.

Let us, after these observations, return to the distinction between animals and vegetables. You now perceive that although

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* This is asserted by Smellie, in his "Philosophy."

Man at the head of the animal kingdom—How resembling inferior animals—How differing from them—Buffon's description of man—Senses of the orders of animals next to man.

you would find no difficulty with regard to a nightingale and a rose, to discover to which of the kingdoms of nature they belong; yet, with respect to a polypus or coral, and a mushroom or a lichen, it would be somewhat difficult, without a previous knowledge of their classification, to say which is called animal, and which vegetable, or to give the distinctions between them. We have seen that the polypus may be increased by cutting shoots and engrafting them upon other animals, in the same manner as vegetables may be increased.

With respect to sensation, some plants discover this, apparently even in a greater degree than some of the last orders of animals; the *sensitive plant* shrinks from the touch; the *Dionea* suddenly closes its leaves upon the insect which touches them; the leaves of plants follow the direction of light, in order to present their upper surfaces to its influence; this you can observe in flower pots placed by a window. The seed of a plant, in whatever situation it may be placed in the earth, always sends its root downwards, and its stem upwards; in these cases, does there not seem as much appearance of sensation and instinct, and even more than in the lower orders of animals?

We find then, that the possession, or want of instinct, does not constitute a mark of distinction between animals and plants. Some have attempted to draw a line of distinction, by considering, that locomotion, or the power of changing place, belongs to animals only; but this seems to fail, since we find animals fixed to the bottom of the sea, or growing upon rocks, and plants moving upon the surface of the water.

Another mark of distinction has been given, in the supposed presence of nitrogen in animals, detected by an empyreumatic odour when animal substances are burning, similar to what we perceive in the combustion of bones; but nitrogen has also been discovered in some vegetables.

It appears then from a comparison between animals and vegetables, that these beings are closely connected by the essential characters of organization; that it seems impossible to distinguish them by any trait that belongs exclusively to either; that the connexion between them appears the most striking in the least perfect species of both kingdoms; and that as we recede from this point, the differences become more numerous and more marked. We may illustrate this view, by imagining two ascending chains of beings, rising from one common point, each side of the chain becoming more and more unlike in proportion to the intervening distance from the centre. From this same central point, also proceeds the chain of inorganized substances;

Analogies between the lower orders of animals and plants—Chains of beings proceeding from one point.

some imperfect animals resembling plants in their outward form, and others resembling minerals in their hard and calcareous coverings.

Having thus learned the almost imperceptible gradations, by which the animal and vegetable kingdoms are blended, we must, in stating the important differences which exist between animals and plants, consider these imperfect species of both kinds, as exceptions to any general rule, and confine ourselves to perfect animals and plants.

1st. With respect to the elements which compose them; carbon, hydrogen and oxygen, form the base of vegetable substances; animals exhibit the same elements with this important distinction, that carbon prevails in plants, and nitrogen in animals.

2d. They differ in their food; plants are nourished with inorganized matter, absorbed with water, the various substances which this liquid holds in solution; animals are mostly nourished either by vegetables or other animals.

3d. Plants throw off oxygen gas, and inhale carbonic acid; animals in respiration inhale oxygen gas, and throw off carbonic acid.

4th. Although plants and animals both possess a principle of life, it is in the one case much more limited than in the other; exhibiting itself in plants by a feeble power of contraction or irritability; in animals appearing in sensation, muscular movement and voluntary motion.

We might trace a great variety of analogies between even the most perfect plants and animals, but we must not extend our remarks farther upon this part of our subject.

Inorganic bodies form the solid base of the globe. *Minerals* are spread upon the face of the earth or lie buried beneath its surface. They form vast masses of rocks, chains of mountains, and the ground upon which we tread. The *Water* occupies a still greater surface of the earth than the land; it is filled with life and animation; the treasures and wonders of the deep seem almost unbounded. The *Air*, lighter than earth and water, extending on all sides about forty miles in height, surrounds the whole globe, separating us from the unknown elements which exist beyond it. Among the inorganized substances upon our globe, is *Heat* or *Caloric*, the subtle fluid which pervades all matter, in an increasing proportion from solids to fluids, and from fluids to gases; and *Light*, which reflects its hues from terrestrial objects, producing by the decomposition of its rays, all the beautiful variety of coloring. The laws which govern

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Differences between the most perfect animals, and most perfect plants—Different kinds of inorganic matter.—

these two substances, so extended in their existence, and so various in their operations, are explained in the sciences of Chemistry and Optics.

Wherever we turn our eyes, we behold wonders; "if we go up to Heaven, God is there;" "the firmament showeth forth his handy work;" if we contemplate the earth on which we are placed, and all its varied tribes of beings, with the inorganized substances formed for their comfort and subsistence, we realize, that "even the hairs of our head are all numbered," and that it is indeed GOD, "who maketh the grass to grow upon the mountains, and herbs for the use of man."

The Deity manifested in his work.

CONCLUSION.

The Universe, how vast! exceeding far,
The bounds of human thought; millions of suns
With their attendant worlds, moving around
Some common centre, gravitation strange!
Beyond the thought of finite minds to scan.
Can He, who in the highest heav'n sublime,
Enthron'd in glory, guides these mighty orbs,
Can He behold this little spot of earth,
Lost midst the grandeur of the heav'nly host?
Can God bestow one thought on fall'n man?
  Turn, child of ignorance and narrow views,
Thy wilder'd sight, from off these dazzling scenes;
Turn to thy earth and trace the wonders there.
Who pencils, with variegated shade,
The lowly flower, that decks the rippling stream,
Or gorgeously attires the lily race?
Who with attentive care, each year provides,
A germ to renovate the fading plant,
And gives soft show'rs, and vivifying warmth;
Kindling within the embryo inert,
The little spark of life, unseen by all,
Save him who gave it, and with care preserved?
Who teaches, when this principle of life
Thus animated, swells the germ within,
And bursts its tomb, rising to light and air;
Who teaches root and stem to find their place,
Each one to seek its proper element?
  Who gilds the insect's wings and leads it forth
To feast on sweets, and bask in sunny ray?
None could the life of plant or insect give;
Save God alone, He rules and watches all;
Scorns not the least of all His works; much less
Man, made in his image, destin'd to exist,
When e'en yon brilliant worlds shall cease to be.
Then how should man rejoicing in his God,
Delight in His perfections, shadow'd forth
In every little flow'r, and blade of grass!
Each opening bud, and care perfected seed,
Is as a page, where we may read of God.

NOTE.

In the annexed descriptions of genera and species, care has been taken to select such plants as may be most easily obtained for purposes of analysis: for this reason most of the common exotics have been admitted; as flowers from the garden may often be at hand, when circumstances would render the collection of wild plants inconvenient.

BOTANICAL DISTRICTS.

Eaton considers North America as divided into *two botanical districts*, *northern and southern.* The dividing line to be drawn from the mouth of Delaware river, (N. Lat. 39°, W. Lon. 75°,) to the south end of Lake Michigan, (N. Lat. 41° 31′); leaving in the northern district all Pennsylvania, and the north part of Delaware, Maryland and Ohio. The division line thus rises as we go towards the west, because southern plants extend to higher latitudes on the western side of the Allegany range, than on the eastern side.

The northern district is divided into *eastern* and *western*, by a line drawn from the intersection of the Allegany range and the Potomac river, in the direction of Cayuga lake. The Allegany mountain is the dividing line in the southern district.

Explanation of figures, letters and characters, used in the Generic and Specific descriptions.

NUMBERS.

The *first number* following the generic description, is the number of the natural order of Linnæus, to which the genus belongs: the *second number* is that of Jussieu. The *first number* on the *left* of the generic name, is the number of the artificial class to which it belongs; the *second*, of the artificial order; the *first* on the *right*, is the number of the natural order of Linnæus; the *second*, of Jussieu.

LETTERS.

E and *W* are used to denote that the plant is found in the *eastern* or *western* division of either of the districts.

S, at the end of a description, shows that the plant grows in the *southern* as well as northern district.

O, (omnibus locis,*) indicates that the plant is common to the whole district.

A, (alpine,) indicates that the plant is most common on mountains, or elevated places.

L, (littoribus,†) indicates that the plant is most common at or near shores.

COLORS OF COROLLAS.

r. red—p. purple—y. yellow—w. white—b. blue—g. green.

TIME OF FLOWERING.

Ap. April—M. May—J. June—Ju. July—Au. August—S. September—Oc. Cctober.

DURATION, &c.

☉ annual—♂ biennial—♃ perennial—♄ woody.

ACCENT AND QUANTITY.

The marks over the generic and specific names, have reference, not only to the *syllable which is to be accented*, but to the *quantity of the vowel* in the accented syllable, as either *long* or *short*.

Those syllables over which the *single mark* is placed, have the *vowel* pronounced *long*, as in *Fra-ga′-ri-a:* those over which the *double mark* is placed, have the *vowel* pronounced *short*, as fn *He-pat″-i·ca ;* in the latter case, the stress of voice seems thrown upon the consonant, the two marks may, therefore be considered as indicating that the consonant, as well as vowel is accented.

The general rule respecting words of two syllables is simple, and renders it unnecessary to prefix to such words the marks for accent and quantity.

Words of *two syllables* always have the *accent* on the *first ;* if the syllable *end with a vowel it is long* as in *Cro′-cus ;* if it *end with a consonant it is short*, as in *Cac″-tus.*

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[*] Literally translated, *in all places.*

[†] By shores.

GENERA OF PLANTS.

The following descriptions of genera and species, are mostly taken from *Eaton's Manual*; a few however, have been selected from other works, chiefly from Torrey.

CLASS I. MONANDRIA.

ORDER I. MONOGYNIA.

Salicor″nia. Calyx inflated, entire, 3 or 4-sided, obconic : corolla 0; style 2-cleft : seed 1, enclosed in the calyx. 12. 29—(samphire.) *S.*

Hippu′ris. Calyx superior, obsolete, with a 2-lobed margin : corolla 0; seed 1 : stigma simple : style in the groove of the anther. 15. 86—(marestail)

ORDER II. DIGYNIA.

Blitum. Calyx 3-cleft, or 3-parted, berry-like : corolla 0 : seed 1, immersed in the calyx. 12. 29—(blite.)

CLASS II. DIANDRIA.

ORDER I. MONOGYNIA.

A. *Corolla 1-petalled, inferior, regular: seeds in a drupe or nut.*

Ligus″trum. Calyx 4-toothed : corolla with 4 ovate divisions : berry 1 or 2-celled, 2 or 4-seeded. 44. 37—(prim.)

Exotics.

Jas″minum. Corolla salver-form, 5 to 8 cleft : berry 2-seeded, each seed solitary, arilled. 44. 37—(jasmine.)

Syrin″ga. Corolla salver-form : capsule 2-celled. 44. 37—(lilac.)

B. *Corolla 1-petalled, inferior, irregular; seeds in capsules.*

Veron″ica. Calyx 4-parted : corolla cleft into 4 lobes, lower division smaller : capsule obcordate, few-seeded, 2-celled. 40. 35—(speedwell.) S.

Septan″dra. Calyx 5-parted, segments acuminate : corol tubular campanulate, border 4-lobed, a little ringent, lower segment narrower : stamens and at length the pistils much exserted : capsule ovate, acuminate, opening at the top. 40. 35.—(culver's physic.) *S.*

Gra′tiola. Calyx 5-parted, often with 2 bracts at the base : corol irregular, resupinate, 2-lipped, upper lip 2-lobed, lower one equally 3-cleft : stigma 2-lipped : capsule 2-celled, 2 valved. 40. 40.—(hedge-hyssop.) *S.*

Linder″nia. Calyx 4-parted : corol resupinate, tubular, 2-lipped; upper lip short, reflexed, emarginate; lower one trifid, unequal : filaments 4, the 2 longer ones forked and barren : capsule 2-celled, 2-valved, the dissepiment parallel to the valves. 40. 40. *S.*

Catal″pa. Corolla 4 or 5-cleft, somewhat inflated, bell-form : calyx 2-parted or 2-leaved : stigma 2-lipped : capsule cylindric, 2-celled. 40. 45—(catalpa tree.) *S.*

C. *Corolla 1-petalled, inferior, irregular; seeds naked.*

Monar″da. Calyx cylindric, striated, 5-toothed : corolla ringent, tubular, upper lip lance-linear, involving the filaments, lower lip reflexed, 3-lobed. 42. 39—(Oswego tea, mountain-mint.) *S.*

Lyco′pus. Calyx tubular, 5-cleft or 5-toothed : corol tubular, 4-cleft, nearly equal : upper division broader and emarginate : stamens distant : seeds 4, retuse. 42. 39—(water horehound.) *S.*

Sal″via. Calyx tubular, striated, 2 lipped, under lip 2 to three-toothed, lower lip 2 cleft: corolla ringent: filaments transversely or laterally affixed to a pedicel. 42. 39—(sage.) *S.*

Collinso'nia. Calyx tubular, 2-lipped, upper lip 3-toothed: corolla funnel-form, unequal, under lip many-cleft, capillary: one perfect seed. 42. 39—(horse-balm.) *S.*

Exotic.

Rosmari'nus. Corolla ringent, upper lip 2-parted: filaments long, curved, simple, with a tooth. 42. 39—(rosemary)

D. *Corolla superior.*

Circæ'a. Calyx 2-leaved or 2-parted: corolla 2-petalled: capsule hispid, 2-celled, not gaping; cells 1 or 2 seeded. 48. 88—(enchanter's nightshade.) *S.*

ORDER II. DYGYNIA.

Anthoxan''thum. Calyx glume 2-valved, 1-flowered: corolla glume 2-valved, acuminate, awned near the base. 4. 10—(sweet vernal grass.) *S.*

CLASS III. TRIANDRIA.

ORDER I. MONOGYNIA.

A. *Flowers superior.*

Iris. Calyx spatha 2 or 3-valved: corolla 6-parted, divisions alternately reflexed: stigmas 3, petal-like: style short: capsule 3-celled. 6. 18—(flower-de-luce, iris or flag.) *S.*

Exotic.

Crocus. Spatha radical: corolla funnel form, with a long slender tube: stigma deep-gashed, crested. 6. 18—(saffron.)

Southern.

Ix''ia. Spatha 2 or 3-valved, ovate, short; corolla 6-parted or 6-petalled; sometimes tubular: stamens strait or incurved: stigmas sub-filiform. 6. 18.

B. *Flowers inferior.*

Commeli'na. Spatha cordate; perianth 3-leaved: corolla 3-petalled sub-equal: 3 barren filaments—sometimes the whole 6 filaments bear anthers: stigma simple: nectaries 3, cross-form, inserted on peculiar filaments: capsule sub-globose, 3-celled, cells 2-seeded or empty. 6. 13—(day flower.) *S.*

Xyris. Calyx a cartilaginous glume, 2 or 3-valved, in a head: corolla 3-petalled, equal, crenate: capsule 3-valved, many-seeded. 6. 13—(yellow-eyed-grass.) *S.*

ORDER II. DYGYNIA.

A. *Spikelets 1-flowered: corollas without abortive rudiments of flowers at the base.*

(*Calyx and corolla different in texture.*)

Leer''sia. Calyx 0: corol 2-valved, closed; valves compressed, boat shaped: nectary obovate, entire, collateral: stamens varying in number. 4. 10—(cut-grass.) S.

Exotic.

Sac''charum. Calyx involucred with long wool at the base, 2-valved: corolla 1 or 2-valved: stamens 1 to 3. 4. 10—(sugar-cane.)

(*Calyx and corolla of similar texture—flowers in spreading panicles.*)

Agros''tis. Calyx herbaceous, 2-valved, 1-flowered, valves acute: a little less than the corolla: corolla 2-valved, membranaceous, often hairy at the base: stigmas longitudinally hispid or plumose, florets spreading: nectary lateral: seed coated. 4. 10—(redtop.) *S.*

Arun''do. Calyx 2-valved, unequal, membranaceous, surrounded with hair at the base; lower valve mucronate or slightly awned. Sometimes there is a pencil-form rudiment at the base of the upper valve. 4. 10—(reed.)

(*Calyx and corolla of similar texture—flowers in compact panicles, often spike-form.*)

Phle'um. Calyx hard, 2-valved, equal, sessile, linear, truncate, bicuspidate: corolla enclosed in the calyx, 2-valved, awnless, truncate. 4. 10—(timothy-grass.) *S.*

B. *Spikelets 1 flowered; corolla with 1 or 2 abortive rudiments of flowers at the base.*

(*Calyx and corolla of similar texture.*)

Phala'ris. Calyx membranaceous, 2-valved, valves keeled, nerved, equal in length, including the 2-valved pilose corolla. The corolla is shorter than the calyx and coriaceous: rudiments opposite, sessile, resembling valves: nectary lateral. 4. 10—(ribbon-grass, canary-grass.) *S.*

C. *Spikelets many-flowered.*

(*Flowers in panicles; corolla unarmed.*)

Bri'za. Spikelets heart-ovate, many-flowered: calyx chaffy, shorter than the 2-ranked florets: corolla ventricose: lower valve cordate, upper one orbicular, short. 4. 10—(quake-grass.) *S.*

Po'a. Spikelets oblong or linear, compressed, many-flowered: calyx shorter than the florets: corolla herbaceous, awnless, often arachnoid at the base; lower valve scarious at the margin. 4. 10—(spear-grass.) *S.*

Exotic.

Sorghum. Florets in pairs, one perfect, with a 3-valved corolla, and sessile; the other staminate or neutral, and pedicelled. 4. 10—(broom-corn.)

(*Flowers in panicles; corol armed or mucronate.*)

Dac''tylis. Spikelets aggregated in unilateral heads, many-flowered: calyx shorter than the florets, with one large glume, keeled, pointed: corolla with the lower valve keeled, emarginate, mucronate; upper valve sub-conduplicate. 4. 10—(orchard-grass.) *S.*

Ave'na. Calyx 2-valved; 2, 3, or many-flowered: corolla, valves mostly bearded at the base, lower one torn, with a twisted awn on the back: glumes membranaceous, and somewhat follicle-like: seed coated. 4. 10—(oats.) *S.*

D. *Flowers in spikes.*

Lo'lium. Calyx 1-leafed, permanent, many flowered: florets in many flowered 2-rowed simple sessile spikelets on a rachis: lower valve of the corolla herbaceous-membranaceous, mucronate, or bristled at the tip. 4. 10—(darnel-grass.)

Tri'ticum. Calyx 2-valved, about 3-flowered; florets sessile on the teeth of the rachis, obtusish and pointed: glumes beardless, or interruptedly bearded. 4. 10.—(wheat.)

Seca'le. Calyx 2-valved, 2 or 3-flowerd: spikelets sessile on the teeth of the rachis, with the terminal floret abortive: calyx 2-valved; glumes subulate, opposite, shorter than the florets: corolla with the lower valve long-awned. 4. 10—(rye.)

E. *Flowers polygamous.*

(*In panicles.*)

Pan''icum. Calyx 2-valved, 2-flowered; the lower glume generally very small: the lower floret abortive, 1 or 2-valved; the lower valve resembling the calyx, the upper one membanaceous: perfect floret with cartilaginous valves, unarmed. 4. 10—(cockfoot-grass, panic-grass.) *S.*

(*In spikes.*)

Hor''deum. Spikelets 3 at each joint of the rachis, 1 or 2-flowered, all perfect, or the lateral ones abortive: glume lateral, subulate: perfect flower with a 2-valved corolla; lower valve ending in a bristle: seed coated. 4. 10—(barley.)

ORDER III. TRIGYNIA.

Mollu'go. Calyx 5-leaved, coloured within: corol 0: capsule 3-celled, 3-valved. 22. 82—(carpet-weed.) *S.*

CLASS IV. TETRANDRIA.

ORDER I. MONOGYNIA.

A. *Flowers superior.*

(1-*petalled.*)

Cephalan''thus. Inflorescence in a head: general calyx none; proper calyx superior, minute, angular, 4-cleft: corolla funnel-form; receptacle globular, hairy: capsules 2 to 4-partible: seed solitary, oblong. 48. 56—(button-bush.) *S.*

Dip''sacus. Flowers in an ovate or roundish capitulum; common calyx (involucre) polyphyllous, foliaceous; proper calyx monophyllous, superior: coral tubular, 4-cleft: seed solitary, with a wine-glass form egret: receptacle, conic, paleaceous. 48. 56—(tassel.)

Ga'lium. Calyx 4-toothed: corolla flat, 4-cleft: fruit dry: seeds 2, roundish: (leaves stellate.) 47—57—(bedstraw.) *S.*

Housto'nia. Calyx half superior, 4-toothed: corolla salver-form, 4-cleft; capsule 2-celled, many-seeded, opening transversely. 47. 57—(Venus,pride.) *S.*

Metehel''la. Calyx 4-toothed: corols 2 on each germ, funnel-form; tube cylindric; limb 4-parted, spreading, villose on the inside: stamens scarcely exsert; stigma 4-cleft: berry double, 4 seeded. 48. 57—(partridge berry.) *S.*

Linnæ'a. Calyx double; that of the fruit 2-leaved, inferior; that of the flower 5-parted: corolla bell-form, 5-lobed: stamens somewhat didynamous; stigma globose: berry 3-celled, dry, generally producing a perfect seed in but one cell. 48. 58—(twin flower.)

Southern.

Ru'bia. Calyx 4-toothed: corolla 4 or 5-cleft, bell-form: berries 2, one-seeded, (stamens 4-5; leaves stellate.) 47. 57—(madder.)

(4-*petalled.*)

Cornus. Calyx 4-toothed: drupe with a 2-celled nut. Some species have a 4-leaved involucrum. 45. 58—(dogwood, false box.) *S.*

Ludwe'gia. Calyx 4 parted, persistent: corol sometimes 0: capsule quadrangular, 4-celled, inferior, many-seeded. 17. 88.—*S.*

B. *Flowers inferior.*

(1-*petalled.*)

Planta'go. Calyx 4-cleft: corolla 4-cleft, reflexed: capsule 2-celled, opening transversely: stamens exsert, very long. 54. 31—(plantain, ribwort.) *S.*

Echi''um. Calyx 5-parted; segments subulate, erect: corol sub-campanulate; tube very short; border unequally 5-lobed, the lower segment acute and reflexed; orifice naked: stigma bifid; seeds tuberculate, not perforated at the base. 41. 42.

Southern.

Ly'cium. Corolla tubular, having the throat closed by the beards of the filaments: stamens often 5: berry 2-celled, many-seeded. 28. 41—(matrimony.)

(*Apetalous.*)

Icto'des. General calyx a spatha; spadix simple, covered with flowers; perianth corolla-like, deeply 4-parted, permanent, becoming thick and spongy; style pyramid-form, 4-sided; stigma simple, minute: berries globose, 2-seeded, inclosed in the spongy spadix receptacle. 2. 7—(skunk-cabbage.)

ORDER II. DIGYNIA.

Hamame'lis. Involucrum 3-leaved: perianth 4-leaved or 4-cleft: petals 4, very long, linear: nut 2-celled, 2-horned. 54. 78—(witch-hazel.) Flowers in autumn, and perfects its seed the following spring. *S.*

ORDER IV. TETRAYGNIA.

Ilex. Calyx minute, 4 or 5-toothed: corolla 4-parted, wheel-form: style 0: stigmas 4: berry 4-celled, cells 1-seeded. 43. 95—(holly.)

CLASS V. PENTANDRIA.

ORDER I. MONOGYNIA.

A. *Flowers 1-petalled, inferior; seeds naked in the bottom of the calyx.*

ROUGH-LEAVED PLANTS.

Myoso'tis. Calyx half 5-cleft or 5-cleft: corolla salver-form, curved, 5-cleft, vaulted, the lobes slightly emarginate; throat closed with 5 convex coverging scales: seeds smooth or echinate. 41. 42—(scorpion-grass.) *S.*

Cynoglos''sum. Calyx 5-parted: corolla short, funnel-form, vaulted; throat closed by 5 converging convex processes: seeds depressed, affixed laterally to the style. 41. 42—(hound-tongue.) *S.*

Exotic.

Bora'go. Corolla wheel-form, the throat closed with rays. 41. 42—(borage.)

Anchu'sa. Calyx 5-parted: corolla funnel-form, vaulted: throat closed: seeds marked at the base, and their surface generally veined. 41. 42—(bugloss.)

Sym''phytum. Limb, or upper part of the corolla, tubular-swelling; the throat closed with subulate rays. 41. 42—(comfrey.)

Southern.

Heliotro'pium. Calyx tubular, 5-toothed: corolla salver-form, 5-cleft, with teeth or folds between the divisions; throat open. (Spikes recurved, involute.) 41. 42—(turnsol.)

B. *Flowers 1-petalled, inferior; seeds covered.*

(*Capsule 1-celled.*)

Anagal''lis. Calyx 5 parted: corolla wheel-form, deeply 5-lobed: capsule opening transversely, globose, many-seeded: stamens hairy. 20. 34—(scarlet pimpernel.) *S.*

Lysimach''ia. Calyx 5-cleft: corolla wheel-form, 5-cleft: capsule 1-celled, globular, 5 or 10-valved, mucronate: stigma obtuse. (In some species the filaments are united at the base.) 20. 34—(loose-strife.) *S.*

Pri'mula. Umbellets involucred: calyx tubular, 5-toothed: corolla salver-form, 5-lobed; tube cylindric; throat open; divisions of corolla emarginate: capsule 1-celled with a 10-cleft mouth: stigma globular. 21. 34—(primrose cowslip.)

(*Capsule 2-celled—rarely 3-celled.*)

Verbas''cum. Calyx 5-parted: corolla wheel form, 5 lobed, somewhat irregular: stamens declined, hairy: capsules 2-celled, 2-valved; valves inflexed when ripened, many-seeded. 28. 41—(mullein.) *S.*

Nicotia'na. Calyx urceolate, sub-tubular, 5-cleft: corolla funnel-form, 5-cleft, limb plaited: stigma notched, capitate: stamens inclined: capsules 2-celled, 2 to 4-valved. 28. 41—(tobacco.)

Convol''vulus. Calyx 5-parted, with or without 2 bracts: corolla funnel-form, plaited: stigma 2-cleft or double: cells of the capsule 2 or 3; each 1 or 2 seeded. 29. 43—(bind-weed.) *S.*

Ipomæ'a. Calyx 5-cleft; naked: corolla funnel or bell-form, with 5 folds;

stigma globe-headed, papillose: capsule 2 or 3-celled, many seeded. 29. 43—(cypress vine, morning glory.) *S.*

(*Capsule 3 to 5-celled.*)

PHLOX. Calyx prismatic, 5-cleft; segments converging: corolla salver-form, 5-lobed, with a tube somewhat curved; filaments unequal in length, attached to the inside of the tube of the corolla: stigmas 3-cleft: cells 1 seeded, seeds oblong, concave. 20. 44—(lichnedia.) *S.*

DATU'RA. Calyx tubular, angled, caducous, with a permanent orbicular base: corolla funnel-form, plaited: capsule 4-valved, 2-celled, and each cell half divided: generally thorny. 28. 41—(thorn-apple.) *S.*

AZA'LEA. Calyx 5-parted: corolla tubular, half 5-cleft, somewhat oblique; stamens on the receptacle, declined; stigma declined, obtuse, usually ending with 5 short papillæ: capsule 5-celled, 5-valved, opening at the top. 18. 50—(wild honeysuckle.) *S.*

VINCA. Corolla salver-form, twisted, border 5-cleft, with oblique divisions; throat 5-angled: seed naked, oblong: follicle-like capsules 2, erect, terete, narrow. 30. 47.

(*Seed in a berry.*)

SOLA'NUM. Calyx 5 to 10-parted, permanent: corolla bell or wheel-form, 5-lobed, plaited: anthers thickened, partly united, with two pores at the top: berry containing many seeds, 2 to 6-celled. 28. 41—(potatoe, nightshade, bitter-sweet.) *S.*

Exotic.

CAP''SICUM. Corolla wheel-form: berry juiceless, inflated: anthers converging: calyx angular. 28. 41—(red pepper.)

C. *Flowers 1-petalled, superior.*

(*Seeds in a capsule.*)

CAMPAN''ULA. Calyx mostly 5-cleft: corolla bell-form, closed at the bottom by valves bearing the flattened stamens: stigma 3 to five-cleft: capsules 3 to 5-celled, opening by lateral pores. 29. 52—(bell-flower.) *S.*

LOBE'LIA. Calyx 5-cleft: corolla irregular, often irregularly slitted: anthers cohering, and somewhat curved; stigma 2-lobed: capsule 2 or 3-celled. 29. 52—(cardinal flower, wild tobacco.) *S.*

DIERVIL''LA. Calyx oblong, 5-cleft, with 2 bracts: corolla 5-cleft, twice as long as the calyx, funnel-form: border 5-cleft, spreading: stigma capitate: capsule oblong, 4-celled, naked, many-seeded. 48. 58—(bush honeysuckle.) *S.*

(*Seeds in a berry.*)

LONICE'RA. CAPIFO'LIUM. Calyx 5-toothed: corolla tubular, long, 5-cleft, unequal :stamens exsert: stigmas globose: berry 2 or 3-celled, distinct; seeds many. 48. 58—(trumpet honeysuckle.) *S.*

XYLOS''TEUM. Calyx 5-toothed, with 2 connate bracts: corolla tubular; border 5-parted, nearly equal: berries in pairs, united at their bases, or combined in one; 2-celled. 48. 58—(fly honeysuckle, twin-berry.)

Exotic.

MIRA'BILIS. Corolla funnel-form, coarctate (compressed or narrowed) below: calyx inferior: germ between the calyx and corolla; stigma globular. 54. 32—(four o'clock.)

D. *Flowers 5-petalled, inferior.*

(*Seed in a capsule.*)

IMPA'TIENS. Calyx 2-leaved, deciduous: corolla irregular, spurred: anthers cohering at the top: capsule 5-valved, bursting elastically when ripe. 24. 73.—(touch-me-not, jewel weed.) *S.*

VI'OLA. Calyx 5-leaved or deeply 5-cleft: corolla irregular, with a horn behind; (sometimes the horn is wanting or a mere prominence) anthers attached by a membranous tip, or slightly cohering: capsule 1-celled, 3 valved. 29. 80—(violet.) *S.*

Clayto'nia. Calyx 2-leaved or 2-parted, the leaves valve-like: corolla 3-petalled, emarginate: stigma 3-cleft: capsule 1-celled, 3-valved, 3 to 5-seeded. 13. 86—(spring beauty.) *S.*

Ceanr'ohus. Petals scale-like, vaulted; claws long, standing in the 5-cleft, cup-form calyx; stigma 3 berry or capsule dry, 3-grained, 3-celled, 3-seeded, 3-parted, opening on the inner side. 43. 95—(New Jersey tea.) *S.*

Celas"trus. Calyx 5-lobed, flat: corolla spreading: capsule obtusely 3-angled, 3-celled, berry-like: valves bearing the partitions on their centres; cells 1 or 2-seeded: stamens standing around a glandular 5-toothed disk: style thick: stigma 3-cleft: seeds calyptred or arilled. 43. 95—(staff tree, false bittersweet.)

Exotic.

Gomphre"na. Calyx 5-leaved, coloured; exterior one 3-leaved; 2 leafets converging, keeled: petals 5, villose, (or rather no corolla;) nectary cylindric, 5-toothed: capsule opening transversely, 1-seeded: style semi-bifid. 55. 30—(bachelor's button.)

(*Seed in a berry.*)

Vitis. Calyx 5-toothed, minute: petals cohering at the tip, hood-like, withering: style 0: stigma obtuse, capitate: berry 5-seeded, globular, often diœcious; seeds sub-cordate. 46. 72—(grape vine.) *S.*

Avipelop"sis. Cissus, calyx, minute, 4—5-toothed: petals 4—5, unconnected above, deciduous: germ surrounded with a glandulous disk: berry 2—4-seeded. 46. 72. *S.*

E. *Flowers 5-petalled, inferior.*

Ribes. Calyx bell-form, 5-cleft, (sometimes flat:) corolla and stamens inserted on the calyx: style 2-cleft: berry many-seeded. 36. 85—(currant, gooseberry.) *S.*

Exotic.

Hed"era. Petals oblong: berry 5-seeded, surrounded by the calyx: style simple. 46. 58—(European ivy.)

ORDER II. DIGYNIA.

A. *Corolla 1-petalled, inferior.*

Gentia'na. Calyx 4 or 5-cleft: corolla with a tubular base, bell-form, without pores, 4 or 5-cleft: stigmas 2, sub-sessile: capsule 1-celled oblong: columellas 2, longitudinal: stamens, but 4, when the division of corolla are 4. 47. 46—(gentian.)

Cus"cuta. Calyx 4 or 5-cleft: corolla 4 or 5-cleft, sub-campanulate, withering: capsule 2-celled, dividing transversely at the base; seeds binate. 29. 43—(dodder.)

B. *Corolla 5-petalled.*

Panax. Polygamous. Umbelled. Involucrum many-leaved: calyx 5-toothed in the perfect flower, superior: berry heart-form, 2 or 3-seeded: calyx, in the staminate flower, entire. 46. 59—(ginseng.)

C. *Corolla wanting.*

Chenopo'dium. Calyx 5-parted, obtusely 5-angled, inferior: style deeply 2 cleft: seed 1, lens-like, horizontal, invested by the calyx. 12. 29—(pigweed, oak of Jerusalem.) *S.*

Ul"mus. Calyx bell-form, withering; border 4 or 5-cleft: seed 1, enclosed in a flat membranaceous samara. (Stamens vary from 4 to 8.) 53. 99—(elm.) *S.*

Exotic.

Be'ta. Calyx 5-leaved: seed kidney-form within the fleshy substance of the base of the calyx. 12. 29—(beet.)

D. *Plants umbelliferous: flowers 5-petalled, superior: seeds 2.*

(*Seeds prickly or hispid.*)

Sanic″ula. Seeds with hooked prickles, oblong, solid: umbels nearly simple, capitate: flowers polygamous: involucre few-flowered: calyx 3-parted, permanent. 45. 60. *S.*

Da′ucus. Seeds striate on their joining sides; outer sides convex, having hispid ribs: involucrum pinnatifid: flowers sub-radiated, abortive in the disk. 45. 60.—(carrot.) *S.*

Urasper″mum. **Scandix.** **Myrrhis.** **Chaerophyllum.** Seeds sub-linear, solid, acute-angled, not striate; ribs 5acute; angles a little furrowed, hispid; the joining sides furrowed, and attached to a 2-cleft columella-like receptacle: style subulate, permanent, rendering the seed caudate: involucrum none or few-leaved. Fruit stiped, oblanceolate, polished, part of it hispid. 45. 60—(sweet cicely.)

(*Seeds with wing-like ribs.*)

Angel″ica. Seeds with 3 ribs on their backs, and winged margins; intervals between the ribs grooved: germ oval, corticate; general involucrum none. 45. 60—(angelica.)

Pastina′ca Seeds emarginate at the apex, somewhat winged: ribs 3 besides the wings; intervals striate; joining sides 2-striate: germ oval, compressed, perianth-calyx entire: petals entire, incurved, sub-equal involucrum none. 45. 60—(parsnip.)

Exotic.

Ane′thum. Seeds flat or convex, 5-ribbed: germ lenticular, compressed: calyx and petals entire: involucrums none. 45. 60—(fennel, dill.)

(*Seeds with 3 ribs, nearly equal.*)

Exotic.

Carum. Seeds oblong-ovate, striate: petals carinate, emarginate, inflexed: involucrum about 1-leaved. 45. 60—(caraway.)

(*Seeds with 5 ribs, nearly equal.*)

Co′nium. Seeds 5-ribbed: ribs at first crenate with flat intervals between them: germ ovate, gibbous; perianth entire; petals unequal, cordate, inflexed: general involucrum about 3 to 5-leaved; partial ones mostly 3-leaved, unilateral. 45. 60—(poison hemlock.)

Cicu′ta. Seeds gibbous-convex: ribs 5, obtuse, converging, with intervening tuberculate grooves and prominences: joining sides flat: germ sub-globose, corticate, compressed laterally; calyx obsolete, 5-toothed; petals cordate inflexed: partial involucrums 5 or 6-leaved, or wanting. 45. 60—(water hemlock.) *S.*

Exotic.

A′pium. Seeds convex externally; ribs 5, small, a little prominent: germ sub-globose: perianth entire: petals equal, roundish, inflexed at the apex: involucrum 1 to 3-leaved or wanting. 45. 60—(celery, parsley.)

Corian″drum. Seeds sub-spherical: germ spherical: perianth 5-toothed: petals cordate inflexed, outer ones largest: involucrum 1-leaved, or wanting. 45. 60—(coriander.)

Southern.

Aethu′sa. Fruit ovate, sub-solid, having bark; ribs acute and turgid, intervals acute-angled; joining sides flat, striate: involucrum 1-sided or none. 45. 60—(fools parsley.)

ORDER III. TRIGYNIA.

A. *Flowers superior.*

Vibur″num. Calyx 5-parted or 5-toothed, small: corolla bell-form, 5-cleft, with spreading or reflexed lobes: stigmas almost sessile: berry or drupe 1-seeded. 43. 58—(snowball, sheep-berry, high cranberry.) *S.*

Sambu'cus. Calyx 5-parted or 5-cleft, small: corolla sub-urceolate, 5-cleft: stigma minute, sessile: berry globose, 1-celled, 3-seeded. 43. 58—(elder.) *S.*

B. *Flowers inferior.*

Rhus. Calyx 5-parted: petals 5: berry 1-seeded, small, sub-globular. 43. 94—(sumach, poison-ivy.) *S.*

Staphyle'a. Calyx 5-parted, coloured: petals 5 on the margin of a glandular 5-angled disk: capsules inflated, connate; nuts globular, having a cicatrice, 1 or 2 remaining in each capsule, though several appear as rudiments while in bloom. 23. 95—(bladder nut.) *S.*

ORDER IV. TETRAGYNIA.

Parnas"sia. Calyx inferior, permanent, 5-parted: corolla 5-petalled: nectaries 5 fringed, with stamen-like divisions; globular tips: stigmas sessile: capsule 4-valved, 1 or 2-celled: seed membranaceous-margined. 14. 64—(parnassus grass, flowering plantain.) *S.*

ORDER V. PENTAGYNIA.

Ara'lia. Umbellets involucred; perianth 5-toothed, superior: petals 5: stigmas sessile, sub-globose: berry crowned, 5-celled; cells 1-seeded. 46. 59—(spikenard, wild sarsaparilla.) *S.*

Linum. Calyx 5-leaved or 5-parted, permanent: corolla 5-petalled, inferior, with claws: capsule 5 or 10-valved, 10-celled: seeds solitary, ovate, compressed: filaments spreading or united at the base. 14. 73—(flax.) *S.*

ORDER VI. HEXAGYNIA.

Dros"era. Calyx inferior, deeply 5-cleft, permanent: petals 5, marcescent: anthers adnate: styles 6, or one deeply divided: capsule round, 1 or 3-celled, many seeded: valves equalling the number of stigmas. 20. 68—(sundew.) The leaves of all the species are beset with glandular hairs resembling dew. *S.* .

ORDER XIII. POLYGYNIA.

Zanthorhi'za. Calyx 0: petals 5: nectaries 5, pedicelled: capsule half 2-valved, 1-seeded, about 5 in number. 26. 61—(yellow root.) *S.*

CLASS VI. HEXANDRIA.

ORDER I. MONOGYNIA.

A. *Flowers having a perianth and corolla, without a spatha.*

Tradescan"tia. Calyx inferior, 3-leaved: corolla 3-petalled; filaments with jointed beards: capsules 3-celled, many seeded. 6. 13—(spider-wort.) *S.*

Ber"beris. Mahonia. Calyx inferior, 6-leaved: petals 6, with 2 glands at the claw of each: style 0: berry 1-celled, 2 or 4-seeded: (stigma umbilicate: stamens spring up on being irritated.) 54. 78—(barberry.) *S.*

Cleo'me. Calyx 4-leaved, inferior: petals 4, ascending to one side: glands 3, one at each sinuate division of the calyx except the lowest: stamens from 6 to 20, or more: capsule stiped or sessile, silique-like, often 1-celled, 2-valved. Does not belong to the class Tetradynamia by its natural or artificial characters. It has *no silique* though the capsule appears like a silique, until it is opened. 25. 64—(false mustard.)

B. *Flowers having a spatha or glume, without a perianth.*

Amaryl"lis. Corolla superior, 6-petalled, unequal: filaments unequal in proportion or direction, declined, inserted in the throat of the tube. 9. 17—(atamask lily.) *S.*

Al″lium. Spatha many-flowered: corolla inferior, 6-parted, very deeply divided; divisions ovate, spreading: capsule 3-celled, 3-valved, many-seeded: (flowers in close umbels or heads.) 9. 16—(leek, garlic, onion, cives.) *S.*

Hypox″is. Glume-like spatha, 2-valved: corolla superior, 6-parted, permanent: capsule elongated, narrow at the base, 3-celled, many-seeded: seed roundish. 10. 17—(star-grass.) *S.*

Pontede′ria. Corolla inferior, 6-cleft, 2-lipped, with 3 longitudinal perforations below: capsule with utricles, fleshy, 3-celled, many-seeded: 3 stamens commonly inserted on the tip, and 3 on the tube of the corolla. 6. 17—(pickerel weed.) *S.*

Exotic.

Galan″thus. Petals 3, concave, superior: nectaries (or inner petals) 3 small, emarginate: stigma simple. 6. 17—(snowdrop.)

Narcis″sus. Corolla bell-form, spreading, 6-parted or six petalled, equal, superior: nectary bell-form, 1-leafed, enclosing the stamens. 9. 17—(jonquil, daffodil.)

C. *Flowers having no calyx.*

Hemerocal″lis. Corolla 6-parted, tubular, funnel-form; stamens declined; stigma small, simple, somewhat villose. 10. 16—(day-lily.)

Ornithog″alum. Corolla 6-petalled, inferior, erect, permanent, spreading above the middle: filaments dilated, or subulate, at the base: capsule roundish, angled, 3 celled; seed roundish, naked. 10. 16—(star of Bethlehem.) *S.*

Li′lium. Corolla liliaceous, inferior, 6-petalled: petals with a longitudinal line from the middle to the base: stamens shorter than the style: stigma undivided: capsule sub-triangular, with the valves connected by hairs crossing as in a seive. 10. 14—(lily.) *S.*

Erythro′nium. Corolla liliaceous, inferior, 6-petalled; petals reflexed, having two pores and two tubercle-form nectaries at the base of the three inner alternate petals; capsule somewhat stiped: seeds ovate. 11. 14—(dog-tooth violet, or adder tongue.) *S.*

Uvula′ria. Corolla inferior, 6-petalled, with a nectariferous hollow at the base of each petal: filaments very short, growing to the anthers; stigmas reflexed: capsule 3-cornered, 3-celled, 3-valved; with transverse partitions; seeds many, sub-globose, arilled at the hilum. 11. 14—bell-wort.) *S.*

Convalla′ria. Smilaci′na. Polygona′tum. Dracæ′na. Corolla inferior, 6-cleft: berry globose, 3-celled, spotted before ripening. 11. 12—(solomon seal.) *S.*

Aspar′agus. Corolla inferior, 6-parted, erect; the three inner divisions reflexed at the apex: style very short: stigmas 3: berry 3-celled, cells 2-seeded. 11. 12—(asparagus.)

Exotic.

Polyan′thes. Corolla funnel-form, incurved: filaments inserted in the throat: stigma 3-cleft: germ within the bottom of the corolla. 10. 17—(tuberose.)

Hyacin″thus. Corolla roundish or bell-form, equal, 6-cleft: three nectariferous pores at the top of the germ: stamens inserted in the middle of the corolla: cells somewhat 2-seeded. 10. 16—(hyacinth.)

Tu′lipa. Corolla 6-petalled, liliaceous, style none: stigma thick: capsule oblong, 3-sided. 10. 14—(tulip.)

Aspho′delus. Corolla 6-parted, spreading: nectary covering the germ with 6 valves. 10. 16—(king's spear, or asphodel.)

Southern.

Frittilla'ria. Corolla inferior, 6-petalled, bell-form, with a nectariferous cavity above the claw of each: stamens of the length of the corolla; seeds flat. 10. 14—(crown imperial.)

Scilla. Corolla 6-petalled, spreading, caducous: filaments threadform, attached to the base of the petals. 10. 14—(squills.)

D. *Flowers incomplete; having perianth-like calyx or corolla; but neither in perfection.*

Ac''orus. Receptacle spadix-like, cylindric, covered with florets: calyx 6-parted, naked: corolla 0; (or calyx none, corolla 6-parted or 6-petalled:) style none; stigma a mere point: capsule 3-celled, 3-seeded. 2. 13—(sweet flag.) *S.*

Juncus. Glume or outer calyx, 2-valved; perianth inferior, 6-leaved, glume-like, permanent: stigmas 3: capsules 1 or 3-celled, 3-valved, many-seeded; seeds attached to a partition in the middle of each valve. 5. 13—(rush-grass, bulrush.) *S.*

Order 2d. Digynia.

Exotic.

Ory'za. Calyx, glume 2-valved, 1-flowered: corolla 2-valved, adhering to the seed. 4. 10—(rice.)

Order 3d. Trigynia.

Vera'trum. Polygamous. Calyx 0: corolla 6-parted, expanding; segments sessile, without glands: stamens inserted upon the receptacle: capsules 3, united, many-seeded. 10. 13. *S.*

Tril''lium. Calyx 3-leaved, inferior, spreading: corolla 3-petalled: styles 0: stigmas 3; berry 3-celled, many seeded. 11. 12—(false wake robin.) *S.*

Rumex. Calyx 3-leaved; petals 3, valve-like, converging, (or calyx 6-leaved and corolla none;) stigmas many cleft; seed 1, naked, three-sided. 12. 28—(dock, field-sorrel.) *S.*

Southern.

Chamæ'rops. Flowers polygamous; spatha compressed; spadix branched; perianth 3-parted; corolla 3-petalled; filaments partly united; drupe 3-celled, 2 of them often empty. The staminate flowers grow on distinct plants. 1. 11.—(fan palm.)

Order Polygynia.

Alis''ma. Calyx 3-leaved; petals 3; capsules numerous, 1-seeded, not opening. 5. 13. *S.*

CLASS VII. HEPTANDRIA.

Order 1. Monogynia.

Trienta'lis. Calyx 7-leaved; corolla 7-parted, equal, flat: berry juiceless, 1-celled, many-seeded; number of stamens variable. 20. 34—(chick-wintergreen.)

Æs'culus. Calyx inflated, 4 or 5-toothed; corolla 4 or 5-petalled, inserted on the calyx, unequal, pubescent; capsule 3-celled; seeds large, solitary, chesnut-form. 23. 66—(horse-chesnut.) *S.*

Order 4. Tetragynia.

Sauru'rus. Calyx in an ament or spike, with 1-flowered scales; corolla 0; anthers adnate to the filaments; germs 4; berries or capsules 4, 1-seeded; stamens 6, 7, 8, or more. 2. 6—(lizard tail.) *S.*

CLASS VIII. OCTANDRIA.

Order 1. *Monogynia.*

A. *Flowers superior.*

Oeno'thera. Calyx 4-cleft, tubular, caducous, divisions deflected; petals 4, inserted on the calyx; stigma 4-cleft: capsule 4-celled, 4-valved; seeds not feathered, affixed to a central 4-sided columella. 17. 88—(scabish, or tree-primrose.) *S.*

Epilo'bium. Calyx 4-cleft, tubular; corolla 4-petalled; capsule oblong and of great length; seeds feathered. 17. 88—(willow-herb.) *S.*

Oxycoc'cus. Calyx superior, 4-toothed; corolla 4-parted, the divisions sub-linear, revolute; filaments converging; anthers tubular, 2-parted berry many-seeded. 18. 51—(cranberry.) *S.*

Exotic.

Fuch''sia. Calyx funnel-form, coloured, superiour, caducous: petals (or nectaries) 4, sitting in the throat of the calyx, alternating with its divisions: stigma 4-sided-capitate: berry oblong, 4-celled: seeds numerous. 17. 88—(ear-drop.)

B. *Flowers inferior.*

A'cer. Polygamous. Sometimes hexandrous. Calyx 5-cleft: corolla 4 or 5-petalled, or wanting: samaras 2, united at the base, 1-seeded, often one rudiment of a seed. 23. 66—(maple.) *S.*

Exotic.

Eri'ca. Calyx 4-leaved, permanent: corolla 4-cleft, permanent: filaments inserted on the receptacle: anthers bifid: capsules membranaceous, 4, to 8-celled, the partitions form the margins of the valves: seeds many in each cell. 18. 51—(heath.)

Daphne. Calyx 0; corolla 4-cleft, withering, including the stamens: drupe 1-seeded. 31. 25—(mezereon.)

Tropae'olum. Calyx 4 or 5-cleft, coloured, spurred: petals 4 or 5, unequal: nuts leathery, sulcate. 23. 73—(nasturtion.)

Order 2. *Dygnia.*

Chrysosple'nium. Calyx superior, 4 or 5-cleft coloured: corolla 0: capsule 2-beaked, 1-celled, many seeded. (The terminal flowers in the European specimens are decandrous, but the plant is always octandrous in America.) 13. 84—(golden saxifrage, water-carpet.) *S.*

Order 3. *Trigynia.*

Polyg''onum. Calyx inferior, 5-parted, coloured: corolla 0; seed 1, angular, covered with the calyx. Stamens and pistils vary in number. The calyx in some species might be taken for a corolla. 12. 28—(knot-grass, water-pepper, buckwheat, hearts-ease.) *S.*

CLASS IX. ENNEANDRIA.

Order 1. *Monogynia.*

Laurus. Calyx 4 to 6-parted: corolla 0: nectaries 3, each a 2-bristled or 2-lobed gland, surrounding the germ: drupe 1-seeded. Stamens vary from 3 to 14, but they are generally in two series of 6 each, with 3 of the inner series barren—often diœcious. The calyx may be taken for a corolla. 12. 27—(sassafras, spice-bush.) *S.*

Order 2. *Trygnia.*

Exotic.

Rheum. Calyx none: corolla 6-cleft, permanent: seed 1, 3-sided. 12. 28—(rhubarb.)

CLASS X. DECANDRIA.

Order 1. *Monogynia.*

A. *Flowers polypetalous, irregular, (mostly papilionaceous.)*

Cassia. Calyx 5-leaved: corolla 5-petalled: anthers 3, lower ones beaked, and on longer incurved filaments; legume membranaceous. 33. 93—(cassia.) *S.*

Baptisia. Podalyr''ia. Calyx 4 or 5-cleft half-way, (sometimes 4-toothed) somewhat 2-lipped: corolla papilionaceous; wings of the length of the reflexed banner: stamens caducous: legume inflated, smooth, many-seeded. 32. 93—(wild indigo.) *S.*

Cercis. Calyx 5-toothed, gibbous below: corolla papilionaceous wings longer than the banner; keel 2-petalled: legume compressed: seed-bearing suture margined: seeds obovate. 33. 93—(Judas-tree.) *S.*

B. *Flowers polypetalous, regular.*

Py'rola. Calyx 5-parted: petals 5; styles longer than the stamens: anthers with 2 pores at the base before, and the top after, the opening of the flower; capsule 5-celled, dehiscent at the angles near the base. 18. 51—(shin-leaf.) *S.*

Chimaph''ila. Calyx 5-parted; petals 5; anthers beaked, with 2 pores at the base before, and at the top after, the opening of the flower; style immersed; stigma thick, orbiculate; capsule 5-celled, dehiscent at the angles near the summit. 18. 51—(prince's pine, pipsissiwa.) *S.*

Leiophyl lum. Calyx 5-parted; corolla flat, 5-parted or 5-petalled; stamens longer than the corolla, with lateral anthers opening longitudinally on their insides; capsule 5-celled, dehiscent at the top, 5-valved; valves ovate with margins inflexed, remote, straight; columella sub-ovate, terete, rugose; seeds small, not winged, (leaves always glabrous.) 18. 50—(sleek leaf.) *S.*

Clethra. Calyx 5-parted, permanent; corolla 5-petalled; style permanent; stigma short, 3-cleft; capsule 3-celled, 3-valved, enclosed by the calyx. (Spiked.) 18. 51—(sweet pepper-bush.) *S.*

Exotic.

Ruta. Calyx 5-parted; petals concave; receptacle surrounded by 10 nectariferous dots; capsule lobed. (Petals sometimes 4, and stamens 8.) 26. 81—(rue.)

Southern.

Dionae'a. Calyx 5-parted or 5-leaved; petals 5; stigma fringed; capsule roundish, gibbous, 1-celled, many-seeded. Petals sometimes 6. 20. 68—(Venus' fly-trap.)

C. *Flowers monopetalous.*

Arbu'tus. Calyx inferior, 5-parted, minute; corolla ovate, pellucid at the base; border small, 5-cleft, revolute; filaments hairy; berry 5-celled. 18. 51—(bear berry.)

Epigae'a. Calyx double, outer 3-leaved, inner 5-parted; (or calyx 5-parted, with 3 bracts;) corolla salver-form; border 5-parted, spreading; tube villose within; capsule 5-celled, many-seeded; receptacle 5-parted. 18. 51—(trailing arbutus.) *S.*

Gaulthe'ria. Calyx inferior, double; outer 2-leaved, inner 5-cleft: (or calyx 5-cleft, with 2 bracts;) corolla ovate; border small, 5-cleft, revolute; filaments hairy; receptacle 10-toothed; (or with a 10-pointed nectary;) capsule 5-celled, invested with the inner berry-like calyx. 18. 51—(spicy wintergreen.) *S.*

Vacci'nium. Calyx superior, 5-toothed or 5-parted; corolla bell or pitcherform, 5-cleft, the divisions reflected; filaments inserted on the germ with the corolla; berry 4 or 5-celled, many-seeded. (The foreign species are sometimes octandrous.) 18. 51—(whortleberry.) *S.*

Androm″eda. Lyonia. Calyx 5-parted or 5-toothed, inferior; corolla ovate, roundish, or sub-cylindric, with a 5-cleft reflexed mouth; capsule 5-celled, 5-valved, with partitions contrary. (Stamens sometimes 8.) 18. 51—(white bush, leather-leaf.) *S.*

Kal″mia. Calyx 5-parted; corolla wheel-salver-form, with 10 horns beneath and 10 cavities within, containing the anthers until the pollen is mature; capsule 5-celled, many-seeded. 18. 50—(laurel.) *S.*

Rhododen″dron. Calyx 5-parted; corolla 5-cleft, somewhat funnelform and oblique; stamens declining; varying from 5 to 10; anthers opening by 2 terminal pores; capsules 5-celled, 5-valved, opening at the top. 18. 50—(rose-bay.) *S.*

D. *Flowers without a calyx: (or with a coloured petal like one,) whole plant destitute of green herbage.*

Monot″ropa. Corolla confusedly polypetalous, permanent; petals about 5, with nectariferous hollows at their bases; anthers reniform, subpeltate, 1-celled, giving out pollen by 2 holes near the middle; stigma orbicular, not bearded; capsule 5-celled, 5-valved. 18. 51—(bird's nest.) *S.*

Pteros″pora. Corolla 5-parted; nectary ovate, with a 5-toothed reflexed margin, enclosing the stamens; anthers 2-celled, 2-bristled, subpeltate; filaments flat; style short; stigma capitate; capsule sub-globose, 5-celled. The nectary is considered as a corolla, and the corolla as a calyx, by some. But these three genera should be united in one, by altering two or three words in the definition. 18. 51—(albany beach-drops.)

Order 2. Digynia.

Hydran″gea. Calyx 5-toothed, superior; corolla 5-petalled; capsule 2-celled, 2-beaked, dehiscent between the beaks. 13. 84—(hydrangea.) Vid. Hortensia. *S.*

Saxifra′ga. Calyx 5-parted, mostly half superior; corolla 5-petaled; capsule 2-celled, 2-beaked, opening between the beaks; many-seeded. 13. 84—(saxifrage.) *S.*

Mitella. Calyx 5-cleft, permanent; petals 5-pinnatifid, inserted into the calyx; capsule 4-celled, 2-valved; valves equal. 13. 84.

Sapona′ria. Calyx inferior, 1-leafed, tubular, 5-toothed, without scales; petals 5, with claws; capsule oblong, 1-celled. 22. 82—(soap-wort.) *S.*

Dian″thus. Calyx inferior, cylindrical, 1-leafed, with 4 or 8 scales at the base; petals 5, with claws; capsule cylindrical, 1-celled, dehiscent at the top. 22. 82—(pink, sweet-william.)

Order 3. Trigynia.

Sile′ne. Calyx 1-leaved, tubular or conic, 5-toothed; petals 5, with claws, generally crowned at the orifice; capsule 3-celled, 6-toothed, many-seeded. 22. 82.

Arena′ria. Calyx inferior, spreading, 5-leaved; petals 5, entire; capsule 1-celled, many-seeded. 22. 82—(sandwort.) *S.*

Exotic.

Horten″sia. Flowers deformed; florets solitary: calyx 5-toothed, minute; corolla 5-petalled; the gay flowers composing the cyme have a large, coloured, permanent, petal-like, 5-leaved calyx, and a minute, caducous, 4 or 5-petalled corolla; stamens 8, 10 or 11. 13. 84—(changeable hydrangea.)

Order 5. *Pentagynia.*

Sper″gula. Calyx 5-leaved; petals 5, undivided; capsule ovate, 5-celled, 5-valved. 22. 82. *S*,

Ceras″tium. Calyx 5-leaved; petals 5, 2-cleft, or emarginate; capsule 1-celled, dehiscent at top, 10-toothed. 22. 82—(mouse-ear, chickweed.) *S.*

Agrostem″ma. Calyx 5-cleft, prismatic or tubular; coriaceous; petals 5, with claws; border obtuse, entire; capsule 1-celled, many-seeded, opening with 5 teeth. 22. 82—(cockle.) *S.*

Oxa″lis. Calyx permanent, 5-parted or 5-leaved, inferior; petals 5, cohering by the claws; capsule 5-celled, 5-cornered, dehiscent at the corners; seeds 2 or more in a cell, covered with an elastic aril; stamens with 5 shorter, outer ones adhering at their bases. This genus and the Linum might be removed to the class Monadelphia. 14. 73—(wood sorrel.) *S.*

Pentho′rum. Calyx 5 to 10-cleft; petals 5 or 0; capsule 5-cuspidate, 5-celled; cells divided transversely, many-seeded. 13. 83—(virginian orpine.) *S.*

Sedum. Calyx inferior, 5-cleft; 5 petals; 5 nectariferous scales at the base of the germ; capsule 5. 13. 83—(live-forever, or orpine, stone-crop.)

Exotic.

Lychnis. Calyx 1-leaved, oblong, 5-toothed; petals 5, with claws; the limb somewhat 2-cleft; capsule 1 or 5-celled, with a 5-toothed opening. 22. 82—(campion.)

Order 10. *Decagynia.*

Phytolac″ca. Calyx 0; corolla 5-petalled or 5-cleft, calyx-like, inferior; berry 10-cell, 10-seeded. By some authors the calyx is called a corolla. 54. 29—(poke-weed.) *S.*

CLASS XI. ICOSANDRIA.[a]

Order 1. *Monogynia.*

Cactus. Calyx superior, many cleft, imbricate; petals numerous, in many series, the inner ones larger; stigma many-cleft; berry 1-celled, many-seeded, umbilicate. 13. 85—(prickly-pear.) *S.*

Prunus. Calyx -cleft, inferior, bell-form; corolla 5-petalled: nut of the drupe smooth with prominent seams at the sutures. 36. 92—(cherry, plum.) *S.*

Cu′phea. Calyx tubular-ventricose, 6 to 12-toothed, unequal: petals 6, mostly unequal, inserted on the calyx; capsule 1-celled, dehiscent, longitudinally with the calyx, follicle-like, 3-sided; seeds lenticular. 54. 91—(wax-bush.) *S.*

Exotic.

Myrtus. Calyx superior, 5-cleft; petals 5; berry 2 or 3 celled, many-seeded. 19. 89—(myrtle.)

Amyg″dalus. Calyx 5-cleft inferior; petals 5; drupe with a nut, perforated with pores; flowers sessile. 36. 92—(peach.)

Armeni′aca. Flowers sessile; calyx 5-cleft, inferior; petals 5; drupe fleshy, pubescent; nut with one margin acute and the other obtuse, furrowed both sides. 36. 92—(apricot.)

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[a] Darlington proposes Calycandria (calyx stamens) as a substitute; and to extend the class to all stamen bearing calyxes.

Pu'nica. Calyx 5-cleft, superior; petals 5; pome or berry many celled, many-seeded; receptacle parietal; seed berried. 36. 92—(pomegranate.)

Southern.

Philadel"phus. Calyx 4-5-parted, superior, top-form; corolla 4 or 5 petalled; style 4-cleft; capsule 4-5-celled, many-seeded; seed arilled. 19. 89—(false syringa, or mock orange.).

Order 2. *Digynia, to Order* 5. *Pentagynia; or Di-Pentagynia.*

Agrimo'nia. Calyx inferior, 5-cleft or 5-toothed, invested with an outer lobed one; petals 5; stamens 12; seeds 2, in the bottom of the calyx. 35. 92—(agrimony.) *S.*

Cratæ'gus. Calyx superior, 5-cleft; petals 5; styles 1 to 5; berry mealy; seeds 2 to 5, bony. 36. 92—(thorn-bush.) *S.*

Aro'nia. Calyx superior, 5-toothed; petals 5; fruit pomaceous; berry 5 or 10-celled; cells 1 or 2-seeded; seeds cartilaginous. 36.92—(shad-flower, choak berry.) *S.*

Pyrus. Calyx 5-cleft, superior; corolla 5-petalled; pome 5-celled, many-seeded; seed compressed-ovate. 36. 92—(pear, apple, quince.) *S.*

Spirae'a. Calyx 5-cleft, inferior, spreading; corolla 5-petalled; petals equal, roundish; stamens numerous, exsert; capsules 3 to 12, 2-valved within, each 1 to 3-seeded. 36. 92—(steeple-bush, hard-hack.) *S.*

Exotic.

Mesembryan'themum. Calyx superior, 5-cleft; petals numerous, linear, cohering at the base; capsule fleshy, many-seeded, turbinate. 13. 87—(ice-plant.)

Order 13. *Polygynia.*

Rosa. Calyx urn-form, inferior, 5-cleft, fleshy; contracted towards the top; petals 5; seeds numerous, bristly, fixed to the sides of the calyx within. A genus remarkable for the multiplication of its petals, by rich culture. 35. 92—(rose.) *S.*

Rubus. Calyx 5-cleft, inferior; corolla 5-petalled; pistils numerous; berry composed of many juicy, 1-seeded acines, on a dry receptacle. 35. 92—(raspberry, blackberry.) *S.*

Dalibar"da. Calyx 5-cleft, (8-cleft?) inferior; corolla 5-petalled; styles long, caducous, 5 to 8; berry composed of dry granulations. 35. 92—(dry strawberry.) *S.*

Geum. Calyx inferior, 10-cleft, 5 alternate divisions smaller; corolla 5-petalled; seeds with a bent awn; receptacle columnar, villous. 35. 92. —(avens, or herb bennet.) *S.*

Potentil"la. Calyx flat, inferior, 10-cleft; 5 alternate divisions smaller; corolla 5-petalled; petals roundish or obovate; seeds awnless, roundish, rugose, fixed to a dry, small receptacle. 35. 92—(five-finger, cinque-foil.) *S.*

Fraga'ria. Calyx inferior, 10-cleft: 5 alternate divisions smaller; corolla 5-petalled; receptacle ovate, berry-like; acines naked, immersed in the receptacle, caducous. 35. 92—(strawberry.) *S.*

CLASS XII. POLYANDRIA.

Order 1. *Monogynia.*

Ti'lia. Calyx 5 or 6-parted, inferior, caducous; corolla 5 or 6-petalled; capsule 5 or 6-celled, globular, coriaceous, dehiscent at the base; 1-seeded. Often 4 of the cells are empty. 37. 79—(bass-wood.) *S.*

Portulac"ca. Calyx 2-cleft, inferior; corolla 5-petalled; capsule 1-celled, opening transversely; columella 5, filiform. 13. 86—(purslane.) *S.*

Chelido'nium. Calyx 2-leaved, caducous; corolla 4-petalled; silique-like, capsule 1-celled, 2-valved, linear; seeds crested, many. 27. 62—(celandine,) *S.*

Sanguina'ria. Calyx caducous, 2-leaved; corolla about 8-petalled; stigma sessile, twinned, 2-grooved; capsule pod-like, ovate, 1-celled, 2-valved, acute at each end; valves caducous; columella 2, permanent. 27. 62—(blood-root.) *S.*

Podophyl''lum. Calyx 3-leaved, minute; corolla about 9-petalled; stigma large, crenate, sessile; berry 1-celled, crowned with the stigma, large, many-seeded; columella one-sided. 27. 61—(wild mandrake.) *S.*

Actæ'a. Calyx 4-leaved, deciduous; petals 4, often wanting; stigma sessile, capitate; berry superior, 1-celled, many-seeded; seeds hemispherical. 26. 61. (Necklace weed or baneberry.) *S.*

Macro'tis. Calyx about 4-leaved, becoming coloured before expanding, caducous; corolla many minute petals very caducous, or wanting; stigma simple, sessile, curving towards the gibbous side of the germ capsule 2-valved,dehiscent at its strait suture.* 26. 61—(cohosh, black snake root, bug-bane.) *S.*

Sarrace'nia. Calyx double, permanent, 3 and 5-leaved; corolla 5-petalled, caducous; stigma peltate, permanent, very large, covering the stamens; capsule 5-celled, 5-valved, many seeded. 54. 62—(side saddle flower.) *S.*

Nuphar. Calyx 5 or 6-leaved, petals many, minute, inserted on the receptacle with the stamens, nectariferous on their backs; stigma with a broad disk, and radiate furrows, sessile; pericarp berry-like, many-celled, many-seeded. 13. 62—(water-lily, or yellow pond-lily.) *S.*

Nymphae'a. Calyx 4 to 7-leaved; corolla many-petalled, petals about equalling the length the calyx leaves, attached to the germ beneath the stamens; stigma a broad disk, marked with radiated lines; pericarp berry-like, many-celled, many-seeded. 13. 62—(pond-lily.)

Exotic.

Papaver. Calyx 2-leaved, caducous; corolla 4-petalled; stigma a broad disk, with radiating lines; capsule 1-celled, dehiscent by pores under the permanent stigma. 27. 62—(poppy.)

Thea. Calyx 5 or 6-leaved; corolla 6 or 9 petalled; capsule 3-seeded. 54. 71—(tea.)

Citrus. Calyx 5-cleft; petals 5, oblong; filaments dilated at the base, in several parcels; berry 9 to 18-celled; Polyadelphous. 18. 70—(orange, lemon.)

Order 2. Digynia, to order 5. Pentagynia; or Di-pentagynia.

Delphi'nium. Calyx 0: corolla 5 petalled, unequal; nectary 2-cleft, horned behind: capsules 1 or 3, pod-like. By some the corolla is considered as a coloured calyx. 26. 61—(larkspur.) *S.*

Aconi'tum. Calyx0; petals 5, upper one valved: nectaries 2, hooded, peduncled, recurved: capsule 3 or 5, pod-like. By some the collora is considered as a coloured calyx. 26. 61—(monk's hood.) *S.*

Aquile'gia. Calyx 0: petals 5, caducous: nectaries 5, alternating with the petals, and terminating downwards in a spur-like nectary: capsules 5, erect; acuminated with the permanent styles, many-seeded. By some the nectaries are considered as petals and the corolla as a coloured calyx. 26. 61—(columbine.) *S.*

Hyper''icum. Calyx 5-parted; divisions equal, sub-ovate: corolla 5-petalled: filaments often united at the base in 3 or 5 sets: styles 2 to 5; capsules membranaceous, roundish, with a number of cells equal to the number of styles. The bases of the filaments are often in groups, when they are not united. 20. 61—(St. John's wort.) *S.*

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* I see no good reason for changing this name to Botrophis, according to Rafinesque. Our plant does not agree with the description of Actea or Cimicifuga.

Exotic.

Paeo'nia. Calyx 5-leaved: petals 5: styles 0: stigmas 2 or 3: capsules pod-like, many-seeded. Remarkable for the multiplication of petals by rich culture. 26. 61—(peony.)

Order 13. *Polygynia.*

A. *Perianth none.*

Clem''atis. Petals 3, 4, 5. or 6: seeds compressed: styles permanent, becoming long plumose tails. (Some species are diœcious.) 26. 61—(virgin's bower.) By some the corolla is considered a coloured calyx. *S.*

Thalic''trum. Petals 4 or 5; filaments very long: seeds without tails, striate, terete. (Some species are diœcious.) 26. 61—(meadow rue.) The corolla is considered a coloured calyx by some. *S.*

Anemo'ne. Petals 5 to 9: seeds numerous, naked. 26. 61—(wind-flower, rue anemone) The corolla is considered a calyx by some. *S.*

Coptis. Petals 5 or 6, caducous: nectaries small, 5 or 6, cowled: capsules oblong, 5 to 8, stiped, stellate, beaked, many-seeded. 26. 61—(gold thread.) By some the nectaries are mistaken for corollas, and the corollas for calyxes.

Caltha. Petals 5 to 9, orbicular; capsules numerous, (5 to 10,) many-seeded, compressed; 1-celled, spreading: nectaries 0: (pistils variable in number.) 26. 61—(American cowslip.) *S.* By some the corolla is mistaken for a coloured calyx.

Exotic.

Helleb''orus. Petals 5 or more: nectary 2-lipped, tubular; capsules 5 or 6; many-seeded, erectish, compressed. 26. 61—(hellebore.)

B. *Having a perianth.*

Magno'lia. Calyx 3-leaved: corolla 6 to 9-petalled: capsules numerous, imbricate on a strobile-like spike, 2-valved; seeds arilled, pendulous on long cords; berry-like. 52. 75—(magnolia, or beaver-tree.) *S.*

Lirioden''dron. Calyx 3-leaved: corolla 6 or 9-petalled, liliaceous: seeds in a sub-lanceolate samara, imbricate on a strobile-like spike. 52. 75—(tulip tree, or white wood.) *S.*

Hepat''ica. Calyx 3-leaved, a little distance below the corolla, entire; petals 6 to 9: seeds without tails. 26. 61—(liverleaf.) *S.*

Ranun''culus. Calyx 5-leaved; petals 5, with claws, and a nectariferous pore or scale on the inside of each: seeds without tails, naked, numerous. 26. 61—(crow-foot.) Some mistake an extra tegument for a capsule. *S.*

Exotic.

Sempervi'vum. Calyx 9 to 12-parted: petals 8 to 12: capsules 12, many-seeded; (stamens 16 or 20.) 13. 83—(house-leek.)

Ado'nis. Calyx 4-5-leaved; petals 5 or more, without nectariferous pores; seeds awnless. 26. 61—(pheasant's eye.)

CLASS XIII. DIDYNAMIA.

Order 1. *Gymnospermia.*

A. *Calyx 5-cleft, with the divisions, or teeth, nearly equal.*

Teu'crium. Corolla deep cleft on the upper side, and without an upper lip, lower lip 3-cleft, the middle division rounded, stamens and pistils incurved; stamens exsert through the cleavage on the upper side of the corolla. 42. 39—(wood sage, wild germander.) S.

MENTHA. Corolla nearly equal, 4-lobed; broadest division emarginate: stamens crect, distant. 42. 39—(spearmint, peppermint.) *S.*

ISAN''THUS. Calyx somewhat bell-form: corolla 5-parted; tube straight, narrow; divisions ovate, equal: stamens nearly equal; stigma linear, recurved. 42. 39—(blue gentian.)

HEDEO'MA. Calyx 2-lipped, gibbose at the base; upper lip with 3 lanceolate teeth; lower lip with two subulate ones; corolla ringent: 2 short stamens barren. 42. 39—(pennyroyal.) *S.*

NEP'ETA. Calyx dry, striate: corolla with a longish tube; under lip with the middle division crenate, throat with a reflected margin; stamens approximate. 42. 39—(catmint.) *S.*

LA'MIUM. Upper lip of the corol vaulted, entire; lower lip 2-lobed, toothed on each side. 42. 39. *S.*

STACH''YS. Calyx with its divisions awned; corolla with the upper lip vaulted; the lower lip 3-lobed; the middle divisions largest, emarginate; the lateral divisions reflexed; stamens reflexed towards the sides after discharging the pollen. 42. 39.—(wound-wort, hedge nettle.) *S.*

LEONU'RUS. Calyx 5-angled, 5-toothed; corolla with the upper lip erect, villose, flat, entire; lower lip 3-parted; middle divisiou; undivided lobes of the anthers parallel, having shining dots. 42. 39—(mother-wort.) *S.*

VERBE'NA. Calyx with one of the teeth truncate; corolla funnel-form, with a curved tube; border 5-cleft, nearly equal; seeds 2 or four, with an extra vanishing tegument; somtimes 2 stamens are barren. 42. 39—(vervain.) *S.*

MARRU'BIUM. Calyx salver-form, rigid, marked with 10 lines; corolla with the upper lip 2-cleft, linear, straight. 42. 39—(horehound.) *S.*

GLECHO'MA. Calyx 5-cleft; corolla double the length of the calyx; upper lip 2-cleft; lower lip 3-cleft, with the middle segment emarginate; each pair of anthers approaching so as to exhibit the form of a cross. 42. 39—(ground ivy, gill-overground.)

PYCNAN'THEMUM. Involucrum bract-like, many-leaved; under small heads of flowers; calyx tubular, striate; corolla with the upper lip sub-entire; lower lip 3-cleft; middle segment longer; stamens distant, nearly equal; cells of the anthers parallel. 42. 39—(mountain mint.) *S.*

Exotic.

LAVAN'DULA. Calyx ovate, sub-dentate; bracts under-studded; corolla resupinate: stamens in the tube. 42. 39—(lavender.)

SATURE'JA. Calyx tubular, striate; corolla with divisions nearly equal; stamens distant. 42. 39—(savory.)

MOLUCCEL''LA. Calyx bell-form, much larger than the corol, spinose. 42. 39. (shell-flower.)

B. *Calyx 2-lipped.*

ORI'GANUM. Calyxes collected into a 4-sided strobile-like cone, with broad intervening bracts; corolla with the upper lip erect, flat, straight, emarginate; under lip 3-parted, divisions nearly equal. 42. 39—(marjoram.)

PRUNEL''LA. Calyx with the upper lip dilated; filaments 2-forked, with an anther on one of the points; stigma 2-cleft. 42. 39—(self-heal, or heal-all.) *S.*

SCUTELLA'RIA. Calyx with an entire mouth, which is closed with a helmet-form lid after the corolla falls out; tube of the corolla bent. 42. 39—(scull-cap.) *S.*

TRICHOSTE'MA. Calyx resupinate; corolla with the upper lip falcate; and the under lip 3-parted, with the middle division small, oblong; filaments very long-exsert, incurved or coiled. 42. 39.—(blue-curls.) *S.*

Exotic.

THYMUS. Calyx sub-campanulate, with the throat closed with hairs; corolla with the upper lip flat, emarginate; lower lip longer. 42. 39—(thyme.)

MELIS''SA. Calyx dry, flattish above, with the upper lip sub-fastigiate; corolla with the upper lip somewhat vaulted, 3-cleft; lower lip with the middle lobe cordate. 42. 39—(balm.)

Order 2d. Angiospermia.

A. *Calyx 2-cleft or 2-leaved.*

OBOLA'RIA. Calyx bract-like; corolla 4-cleft, bell-form; capsule 1-celled, 2-valved, many-seeded; stamens from the divisions of the corolla nearly equal; stigma 2-cleft or emarginate. 40. 35—(penny-wort.) *S.*

B. *Calyx 4-cleft.*

EUCHRO'MA. Calyx inflated, 2 or 4-cleft; corolla 2-lipped; upper lip long linear, embracing the style and stamens; anthers linear, with unequal lobes, cohering so as to form an oblong disk; capsule ovate, compressed, 2-celled; seeds numerous, surrounded with an inflated membrane. 40. 40. *S.*

BAR''TSIA. EUCHROMA? Calyx lobed, emarginate, coloured; corolla less than calyx; upper lip longest, concave, entire; lower lip 3-cleft and reflexed; anthers with equal lobes, not cohering; capsule 2-celled: seed angled. 40-35—(painted cup.)

MELAM''PYRUM. Corolla with the upper lip compressed, the margin folded back; lower lip grooved, 3-cleft, sub-equal; capsule 2-celled, oblique, dehiscent on one side; seeds 2, cylindric, gibbous, cartilaginous and smooth. 40. 35—(cow-wheat.) *S.*

Southern.

EUPHRA'SIA. Calyx cylindric; corolla 2-lipped; the upper lip 2-cleft; lower lip 3-lobed, with the divisions 2-cleft; lower anthers lobed, spinose. 40. 35—(eye-bright.)

C. *Calyx 4 or 5-cleft, or 5-toothed; plant without green herbage.*

OROBAN''CHE. Corol ringent, capsule ovate, acute, 1-celled; seeds numerous; a gland beneath the base of the germ. 40. 35. *S.*

EPIPH''EGUS Polygamous. Calyx abbreviated, 5-toothed; corolla of the barren flowers ringent, compressed, 4-cleft; lower lip flat; of the fertile flowers minute, 4-toothed, caducous; capsule truncate, oblique, 1-celled, imperfectly two-valved, opening on one side. 40. 35—(beech drops, cancer root.)

D. *Calyx 5-leaved or 5-cleft: plant with green herbage.*

SCROPHULA'RIA. Corol sub-globose, resupinate, shortly bi-labiate, with an internal intermediate scale; capsule 2-celled. 40. 40. S.

BIGNO'NIA. Calyx 5-toothed, cup-form, sub-coriaceous; corolla bell-form, 5-lobed, ventricose beneath; capsule silique-like, 2-celled; seed membrane-winged. 40. 45—(trumpet-flower.) S.

BUCHNE'RA. Calyx 5-toothed; corolla with a slender tube, and the limb in 5 equal divisions, the lobes cordate: capsule 2-celled. 40. 35—(blue hearts.) S.

ANTIRRHI'NUM. Calyx 5-leaved or deeply 5-parted; the two lower divisions remote; corolla personate or ringent, spurred, or with a prominent base; the throat closed with a prominent palate; capsule ovate, 2-valved, dehiscent at the apex, with reflexed teeth. 40. 40—(snap-dragon, toad-flax.) S.

GERAR''DIA. Calyx 5-cleft or 5-toothed; corolla sub-campanulate, unequally 5-lobed; segments mostly rounded; capsule 2-celled, dehiscent at the top. 40. 40—(false foxglove.) S.

PEDICULA'RIS. Calyx ventricose, 5-cleft or obliquely truncate; corolla ringent; upper lip arched emarginate and compressed; capsule 2-celled, mucronate, oblique; seeds numerous, angular, coated. (Leaves many-cleft.) 40. 35—(lousewort, high heal-all.) S.

MI'MULUS. Calyx prismatic, 5-toothed; corolla ringent; upper lip folded back upon its sides, lower lip with a prominent palate; stigma thick, 2-cleft; capsule 2-celled, many-seeded; seeds minute. 40. 40—(monkey-flower.) S.

CHELO'NE. Calyx 5-cleft or 5-leaved, 3-bracted: corolla ringent, inflated;

the upper lip emarginate-obtuse, under lip slightly 3-cleft; the rudiment of a smooth filament between, and shorter than the two tallest stamens; anthers woolly; capsule 2-celled, 2-valved; seeds with membranous margins, 40. 45—snake-head.) S.

Pentste'mon. Calyx 5-cleft or 5-leaved; corolla ringent, inflated; the rudiment of a bearded filament between, and longer than the two tallest stamens; anthers smooth; capsule 2-celled, 2-valved, ovate; seeds numerous, angular. (Taken from the last genus.) 40. 45—(beard tongue.) S.

Exotic.

Digita'lis. Calyx 5-parted; corolla bell-form, ventricose, 5-cleft; stigma simple or bilamellate; capsule ovate, 2-celled.—(Flowers racemed.) 40. 40—(foxglove.)

CLASS XIV. TETRADYNAMIA.

Order 1st. Siliculosa.

Thlaspi. Calyx spreading, equal at the base; filaments distinct, without teeth; silicle compressed, emarginate, obcordate, many-seeded; valves resemble two boats with the keels outward. 39. 63—(shepherd's purse.) S.

Lepid''ium. Calyx spreading; corolla regular; silicle emarginate, cordate or oval; cells 1-seeded; valves carinate, dehiscent; partition contrary. Cotyledons incumbent. 39. 62—(pepper-grass.) S.

Cochlea'ria. Silicle thick, rugose, many-seed, 2-valved; valves gibbous, obtuse: partition nearly parallel to the valves. 39. 63—(horse-radish, water-radish.)

Exotic.

Luna'ria. Silicle entire, oval, flat-compressed, pedicelled; valves equalling the partition, parallel, flat: calyx consists of coloured sack-like leafets. 39. 63—(honesty, or satin-flower.)

Order 2d. Siliquosa.

Denta'ria. Silique lanceolate; valves flat, nerveless, often opening elastically: receptacles not winged: funicule dilated: seeds in a single series, ovate, not margined; cotyledons accumbent. 39. 63—(trickle-root.) S.

Cardamine. Calyx leaves spreading but little: stigma entire: a single gland between each of the short stamens and the calyx: silique with truncate margins, linear, long, bursting elastically with revolute valves, narrower, but equalling the length of the partitions; seed with a slender funicule, not margined. 39. 63—(American water-cress.) S.

Ar''abis. Glands 4, one within each leafet of the erect calyx, of the size of the reflected scale; silique compressed, torulose, sub-divaricate; valves flat, 1-nerved: seeds arranged in a single series. Cotyledons accumbent. 39- 63—(wall-cress.) S.

Erys''imum. *Nasturtium.* Calyx and corolla spreading: silique bursting, not elastically; beak short and terete; valves nerveless, not keeled, straightish, concave. Cotyledons accumbent. 39. 63—(English water-cress, water-radish.) S.

Cheiran'thus. Calyx closed, two of the leafets gibbous at the base; petals dilated; silique, when young with a glandular tooth each side; stigma 2-lobed; seed flat, sometimes margined. 39. 63—(stock-july-flower, wall-flower.) S.

Sina'pis. Calyx spreading; corolla with strait claws; glands between the short stamens and the pistil, and between the long stamens and the calyx; partition extending beyond the valves of the silique, ensiform; seeds in a single series. Cotyledons conduplicate. 39. 63—(mustard.)

Rapha'nus. Calyx closed, setose; silique torose, terete, not opening by valves, 1 or 2-celled; glands between the short stamens and pistil, and between the long stamens and the calyx. Cotyledons conduplicate. 39. 63—(radish.)

Exotic.

Bras″sica. Calyx erect, converging; partition extending beyond the valves of the silique; seed globose; glands between the short stamens and pistil, and between the long stamens and calyx. 39. 63.—(cabbage, turnip.)

CLASS XV. MONADELPHIA.

Order 3. *Triandria.*

Sisiryn″chium. Spatha 2-leaved; perianth 0; corolla superior, 6-cleft or 6-petalled, tubular; style 1; stigma 3-cleft; capsule 3-celled. 6. 18—(blue-eyed grass.) *S.*

Order 5. *Pentandria.*

Passiflo′ra. Calyx 5-parted, coloured: corolla 5-petalled, on the calyx: nectary, a triple filamentous crown within the petals: gourd-like berry, pedicelled. 34. 98—(passion-flower.) *S.*

Exotic.

Ero′dium. Calyx 5-leaved; corolla 5-petalled; nectariferous scales 5, alternating with the filaments; arils 5, 1-seeded, awned; beaked at the base of the receptacle; awn spiral, bearded within. (Taken from geranium. 14. 73—(stork's bill.)

Order 7. *Heptandria.*

Exotic.

Pelargo′nium. Calyx 5-parted, upper division broader, ending in a capillary nectariferous tube; corolla 5-petalled, irregular; the two upper petals usually broader, with coloured veins; filaments 10, 3 of them usually without anthers; arils 5, each 1-seeded, awned; some of the awns spiral. 14. 73—(stork geranium.)

Order 10. *Decandria.*

Gera′nium. Calyx 5-leaved; corolla 5-petalled, regular; nectariferous glands 5, adhering to the base of the 5 alternating long filaments; arils 5, 1-seeded, awned, beaked at the elongated top of the receptacle; awn naked or smooth within, straight. 14. 73—(cranebill, false crowfoot, herb-robert.) *S.*

Southern.

Aca′cia. Mimosa. Polygamous. Calyx tubular, 5-toothed; petals 5; stamens 5 to 10, exsert; pod 1-celled, 2-valved. 33. 93.

Order 12. *Polyandria.*

Sida. Calyx simple, angular, 5-cleft; style many-parted; capsules many, arranged circularly, 1-celled, 1 or 3-seeded. (Pedicel articulated under the apex.) 37. 74—(indian mallows.) *S.*

Althae′a. Calyx double, outer one 6 or 9-cleft; capsules many, arranged circularly, 1-seeded. 37. 74—(Hollyhock.)

Malva. Calyx double, outer one 3-leaved, inner one 5-cleft; capsules, many, arranged circularly, 1-celled, 1-seeded. 37. 74—(mallows.) *S.*

Hibis″cus. Calyx double, outer one many-leaved; inner one about 5-cleft: stigmas 5: capsule 5 or 10-celled, many seeded. 37. 74—(marsh mallows.) *S.*

Exotic.

Gossyp″ium. Calyx double, outer one 3-cleft: capsule 4-celled: seeds involved in wool. 37. 74—(cotton.)

CLASS XVI. DIADELPHIA.

Order 5. *Pentandria, to Order* 8. *Octandria, or Pent-Octandria.*

Coryda'lis. Diclytra. Calyx 2-leaved: corolla ringent, 1 or 2-spurred at the base: filaments 2, membranaceous, each with 3 anthers: capsules silique-like, 2-valved, compressed, many-seeded. In some species the stamens are separate, with broad membranaceous bases. 24. 62—(colic-weed.) *S.*

Fuma'ria. Calyx 2-leaved, caducous: corolla irregular; spurred or gibbous at the base of one petal; filaments 2, each with three anthers: capsule or silicle drupe-like, 1-celled, 1-seeded, not opening by valves: seeds affixed to the side of the cell. 24. 62—(fumitory.) *S.*

Polyga'la. Calyx 5-leaved, permanent, unequal, 2 of the leafets wing-like, larger, coloured; corolla irregular, (or rather, calyx 3-leaved, corolla imperfectly papilionaceous :) capsule obcordate, 2-celled 2-valved. Keel of the corolla sometimes appendaged: seeds hairy. 33. 35—(snake root, milk-wort, low centaury, mountain flax.) *S.*

Order 10. *Decandria.*

A. *Legume without transverse divisions or partitions; seeds numerous.*

(*Stigma pubescent.*)

Pisum. Calyx with the divisions leaf-like, about equal: banner protruding 2 folds: style compressed, carinate, villose above: legume without down at the suture. 32. 93—(pea.)

La'thyrus. Calyx with the two upper divisions shorter: style flat, villose above, broader towards the top. (Stems mostly winged, leafets 2 or more, terminated by a divided tendril.) 32. 93—(sweet pea.) *S.*

Vic''ia. Calyx emarginate above, 2-toothed; 3 straight long teeth below; banner emarginate; style bearded transversely on the lower side beneath the stigma. 32. 93—(vetch.) *S.*

(*Stigma not pubescent.*)

Phase'olus Keel, stamens and style spirally twisted together: legume compressed, falcate: seeds sub-compressed, reniform. 32. 93—(bean.) *S.*

Strophosty'les. Glycine. Keel, stamens and style spirally twisted together: legume terete, with a longitudinal half-breadth partition, attached to one edge: seed reniform, sub-cylindric. 32. 93—(wild bean.) *S.*

A'pios. Glyci'ne. Calyx somewhat 2-lipped, truncate, 1-toothed: keel of the corolla falcate, bending back the apex of the banner: germ sheathed at the base: legume coriaceous, many-seeded. 32. 93—(ground-nut.) *S.*

Amphicar''pa. Calyx bell-form, 4-toothed, obtuse and naked at the base: petals oblong, banner broader, close-pressed upon other petals, sub-sessile: stigma capitate: legume flat, stiped; seeds 2 to 4. 32. 93—(wild bean-vine.) *S.*

Robi'nia. Calyx small, bell-form, 4-cleft, upper division 2-parted: banner large, reflexed, roundish: legume compressed, elongated, many-seeded: seeds compressed, small. 32. 93—(locust tree.) *S.*

Exotic.

Colu'tea. Calyx 5-cleft with the keel obtuse: style bearded on its back through its whole length: legume inflated, opening on the upper suture at the base. 32. 93—(bladder senna, bush locust.)

Southern.

Indigof''era. Calyx spreading: keel with a subulate spur both sides; legume linear, small, terete or quadrangular. 32. 93—(indigo.)

B. *Legume without transverse divisions or partitions; seeds few, or single.*

MELILO'TUS. Flowers racemed: calyx tubular, 5-toothed: keel simple, shorter than the wings and banner: legume rugose, longer than the calyx, or about as long. (Taken from the trifolium.) 32. 93—(melilot clover.) *S.*

TRIFO'LIUM. Flowers sub-capitate: legume included in the calyx, not opening by valves, 1 to 4-seeded. (Leaves always ternate.) 32. 93—(clover.) *S.*

C. *Fruit or loment in several joints, or in a single-seeded piece.*

HEDYS"ARUM. Calyx 5-cleft: keel of corolla transversely obtuse; loment many-jointed; joints 1-seeded, truncate, compressed, generally hispid. Plants mostly with ternate leaves. 32. 93—(bush clover.) *S.*

Exotic.

CORONIL'LA. Calyx 2-lipped: petals with claws: loment teretish, jointed: flowers in umbels; seeds generally cylindric. 32. 93—(coronilla.)

D. *Stamens united in one set.*

AMOR"PHA. Calyx somewhat bell-form, 4 or 5-cleft: banner ovate, concave: wings and keel 0; legume 1 or 2-seeded, falcate. 32. 93—(false-indigo.) *S.*

LUPI'NUS. Calyx 2-lipped: anthers, 5 oblong and 5 roundish; legume coriaceous, torulose. 32. 93—(lupine.) *S.*

CROTALA'RIA. Corolla with the banner cordate, large keel acuminate, the membrane formed by the united filament, has a fissure on the back: style curved; legume pedicelled, turgid. 32. 93.—(rattle box.) *S.*

CLASS XVII. SYNGENESIA.

Order 1. *Polygamia Æqualis.*

A. *Florets ligulate.*

CICHO'RIUM. Calyx calycled; egret plumose, sessile, unequal; (Torrey;) many-leaved, chaffy; (Persoon;) receptacle somewhat chaffy. 49. 53—(succory or endive.)

LEON'TODON. Calyx double, imbricate, with flexible leafets; receptacle naked; egret stiped. 49. 53—(dandelion.) *S.*

PRENAN"THES. Florets from 5 to 20, in a simple series, (or in one circular row;) calyx calycled; receptacle naked; egret simple, sub-sessile. 49. 53—(white lettuce.) *S.*

LACTU'CA. Calyx imbricate, cylindric, with the margin of the scales membranaceous; receptacle naked; egret simple, stiped; seed smooth. 49. 53—(lettuce.) *S.*

HIERAC"IUM. Calyx imbricate, ovate; egret simple, sessile; receptacle naked, punctate, or sub-pilose. (From white becoming yellowish.) 49. 53—(hawk-weed.) *S.*

Exotic.

TRACOPO'GON. Calyx simple, many-leaved: receptacle naked; egret plumose and stiped. 49. 53—(goat's-beard, vegetable oyster.)

B. *Flowers tubulous: flower capitate.*

ARC"TIUM. Calyx globose, with scales hooked at the apex: egret-chaff-bristly: receptacle chaffy. 49. 54—(burdock.) *S.*

CNICUS. Calyx swelling, imbricate, with prickly scales; receptacle villose; egret caducous, plumose. 49. 54—(thistle.) *S.*

CAR″DUUS. Calyx ovate, imbricate with prickly scales: receptacle villose; egret pilose. 49. 54—(comb-tooth thistle.)

Exotic.

CAR″THAMUS. Calyx ovate, imbricate with scales, ovatish-leafy at the apex; egret chaff-hairy or none; receptacle chaff-bristly. 49. 54. (false saffron.)

CYN″ARA. Receptacle bristly; calyx dilated, imbricate, scales with fleshy bases, emarginate and pointed; egret plumose, sessile. 49. 54—(garden artichoke.)

C. *Florets tubulous; flower discoid.*

EUPATO′RIUM. Calyx imbricated (rarely simple) oblong: style long, cloven half way down: egret pilose, scabrous, or rough papillose: receptacle naked: seed smooth and glandular, 5-striate. 49. 55—(boneset, thoroughwort, joe-pye.) *S.*

MIKA′NIA. Calyx 4—6-leaved, 4—6-flowered: receptacle naked: egret pilose. 49. 55—*S.*

Order 2. Polygamia superflua.

A. *Flowers discoid; the ray-florets being obsolete.*

TANACE′TUM. Calyx imbricate, hemispheric: scales acuminate: rays obsolete, 3-cleft: egret somewhat marginal: receptacle naked. Flowers corymbed.) 49. 55—(tansey.)

ARTEMI′SIA. Calyx imbricate, ovate, with scales rounded, converging: ray-florets subulate: egret 0: receptacle somewhat villose, or nakedish. (Flowers mostly rounded.) 49. 55-(wormwood, southern-wood.) *S.*

GNAPHA′LIUM. Calyx imbricate, with the marginal scales rounded, scarious, shortish, glossy, coloured: receptacle naked: egret pilose or plumose, scabrous; florets of the ray subulate, of the disk entire. Sometimes all the florets are perfect. 49. 55—(life everlasting.) *S.*

B. *Flowers radiate: the ligutate ray florets very manifest.*

(*Receptacle naked.*)

ERI′GERON. Calyx imbricate, sub-hemispherical: florets of the ray very numerous and narrow: receptacle naked: egret double; outer minute; inner hairy, of few rays. 49. 55—*S.*

IN″ULA. Calyx imbricate, generally squarrose: egret simple, scabrous, sometimes a minute, exterior, chaffy one: anthers ending in 2 bristles at the base: ray-florets numerous. Ray-florets always yellow. 49. 55—(elecampane.)

ASTER. Calyx imbricate, the inferior scales generally spreading; egret simple, pilose: receptacle often deep-pitted. Florets of the ray more than 10, except in solidaginoides, and a few other species; colour purple or white, never yellow. 49. 55—(star-flower.) *S.*

SOLIDA′GO. Calyx oblong or sub-cylindric, with oblong, narrow, pointed straight scales, imbricate, closed upon the flower: ray-florets about 5, and fewer than 10, lanceolate, 2-toothed, equal to, or shorter than the calyx: filaments capillary, very short: style thread-form, equalling the length of the stamens, stigma cleft, spreading: egret simple, pilose, scabrous: receptacle furrowed with dots or punctures: seeds oblong-ovate. (yellow.) 49. 55—(golden rod.) *S.*

TUSSILA′GO. Calyx simple, swelling; scales equal, and equalling the disk, sub-membranous: pistillate florets ligulate or without teeth: egret simple, sessile. 49. 55—(Sometimes polygamous.)—(coltsfoot.)

CHRYSAN″THEMUM. Calyx hemispherical, imbricate, with the scales membranous at the margin: egret none, or a narrow margin. 49. 55—(ox-eyed daisy, fever-few.) *S.*

Exotic.

Bellis. Calyx hemispherical; scales equal: egret 0: receptacle conical: seed obovate. 49. 45—(garden daisy.)

Tage'tes. Calyx simple, 1-leafed, 5-toothed, tubular: florets of the ray about 5, permanent: egret 5 erect awns. 49. 55—(marygold.)

(Receptacle chaffy or hairy.)

An"themis. Calyx hemispherical; scales with scarious margins, nearly equal: egret 0, or a membranous margin: florets of the ray more than 5: receptacle chaffs flat, with a rigid acuminate apex: seed crowned with a membranous border, or egret. 49. 55—(may-weed chamomile.) *S.*

Achille'a. Calyx imbricate, ovate, unequal: egret 0: florets of the ray 5 to 10, roundish, dilated. (Flowers corymbed.) 49. 55—(yarrow.) *S.*

Heliop"sis. Calyx imbricate, with ovate-linear lined scales: ray-florets linear, large: receptacle chaffy, conic; the chaffs lanceolate: seeds 4-sided: egret 0. 49. 55—(sun-ray.) *S.*

Hele'nium. Calyx 1-leaved, many-parted: egret 5-awned, chaffy leaves: receptacle globose, naked in the disk, and chaffy in the ray only: florets of the ray half-3-cleft: seed villose. (Leaves decurrent.) 49. 55—(false sunflower.) *S.*

Order 3. *Polygamia frustranea.*

Helian"thus. Calyx imbricate, sub-squarrose, leafy: receptacle flat, chaffy: egret 2-leaved, chaff-like, caducous. 49. 55—(sunflower, jerusalem artichoke.) *S.*

Rudbeck"ia. Calyx consisting of a double order of leafets or scales: receptacle chaffy, conic: egret a 4-toothed margin, or 0. 49. 55—(cone-flower.) *S.*

Exotic.

Centav'rea. Calyx various, mostly imbricate, roundish: egret simple, various: receptacle bristly: corollas of the ray, funnel-shape, longer, irregular. 49. 54—(blue-bottle, blessed thistle.)

Order 4. *Polygamia necessaria.*

Exotic.

Calen"dula. Calyx many-leaved, equal: receptacle naked: egret none: seeds of the disk membranaceous. 49. 55—(pot marygold.)

Order 5. *Polygamia segregata.*

Elephan"topus. Partial calyx 4-flowered: florets 5-cleft, ligulate, perfect: receptacle naked: down setaceous. 49. 55—(elephant-foot.) *S.*

CLASS XVIII. GYNANDRIA.

Order I. *Monandria.*

A. *Anther adnate, sub-terminal, not caducous; masses of pollen affixed by the base, and made up of angular particles.*

Orchis. Corolla ringent-like, upper petal vaulted: lip dilated, spurred beneath: masses of pollen 2, adnate, terminal. 7. 21—(orchis.) *S.*

Habena'ria. Corolla ringent; lip spurred at the base beneath: glands of the stalks of the masses of pollen naked and distinct; cells of the stalks adnate, or separated. 7. 21—*S.*

B. *Anther parallel with the stigma, not caducous; masses of pollen affixed to the summit of the stigma, and made up of farinaceous or angular particles.*

Goodye'ra. Corolla ringent-like, the 5 lower petals placed under the gibbous lip, which is undivided above; style free; constituent particles of the masses of pollen angular. 7. 21—(rattlesnake-leaf, scrophula weed.) *S.*

NEOT″TIA. Corol ringent: the 2 lower petals placed beneath the lip which is beardless; interior petals converging; style wingless; pollen farinaceous. 7. 21—*S.*

C. *Anther inserted, terminal, not caducous; masses of pollen farinaceous or angular.*

POGO'NIA. Petals 5, distinct, without glands: lip sessile, cowled, crested-internally; pollen farinaceous. 7. 21—(snake-mouth.) *S.*

CYMBID″IUM. Petals 5, distinct: lip behind,(or inverted,) unguiculate: the lamina bearded: style free: pollen angular. 7. 21—(grass-pink.) *S.*

ARETHU'SA. Petals 5, connate at the base: lip below, growing to the style, cowled above, crested within: pollen angular. 7. 21—(arethusa.) *S.*

Order 2. Diandria.

CYPRIPE'DIUM. Calyx coloured, 1-leaved, spreading; corolla 0, (by some the calyx is called a corolla;) nectary large, hollow, inflated; style with a terminal lobe, and petal-like appendage on the upper side. 7. 21—(ladies' slipper.) *S.*

Order 5. Pentandria.

Plants bearing seeds in follicles; and pollen in masses, called pollinia.

ASCLE'PIAS. Petal 5, reflexed; nectaries 5, concave, erect, containing little horns; each stamen with a pair of pendulous masses of pollen, suspended from the top of the stigma; follicles smooth. 30. 47—(milk-weed, silk-weed.) *S.*

APOC'YNUM. Corolla bell-form; stamens with converging anthers, proceeding from the middle of the stigma and alternating with 5 nectaries; stigma thick, almost sessile; follicles in pairs, long-linear. 30. 47—(dogbane, Indian hemp.) *S.*

Order 6. Hexandria.

ARISTOLO'CHIA. Calyx 0: corolla superior, 1-petalled, ligulate, inflated at the base: capsule 6-celled, many-seeded. 11. 23—(birthwort.) *S.*

Order Polyandria.

AS″ARUM. Calyx subcampanulate, 3—4 cleft: corol 0: anthers adnate to the middle of the filaments; capsule inferior, 6-celled, crowned with the calyx. II. 23—(wild ginger.) *S.*

CLASS XIX. MONŒCIA.

Order 3. Triandria.

TYPHA. Ament cylindric, dense-flowered. Staminate flowers—calyx obsolete, 3-leaved: corolla 0: stamens 3 together, on a chaffy or hairy receptacle, united below into one. Pistillate flowers—below the staminate: calyx 0: corolla 0; seed 1, pedicelled; the pedicels surrounded at the base with long hairs resembling egret. 3. 8—(cat-tail, or reed mace.) *S.*

CAREX. Aments imbricate, (usually in cylindric spikes.) Staminate flowers—calyx-scales single; corolla 0. Pistillate flowers—calyx scale single; corolla inflated, monopetalous, 2-toothed at the apex; stigmas 2 or 3; nut 3-sided, enclosed in the inflated, permanent corolla, which becomes an utriculus-like permanent aril. Sometimes diœcious. 3. 9—(sedge.) *S.*

COMPTO'NIA. Staminate flowers—ament cylindric, with calyx-scales 1-flowered; corolla 2-petalled or none; filaments 2-forked. Pistillate flowers—spike or ament ovate; corolla 6-petalled, (the corolla may be called a calyx;) styles 2; nut oval, 1-celled. 50. 99—(sweet fern.) *S.*

Exotic.

COIX. Staminate flowers—in remote spikes; calyx-glume 2-flowered, awnless: corolla-glume awnless. Pistillate flowers—calyx-glume 2-flowered: corolla-glume awnless: style 2-parted: seed covered with the bone-like calyx. 4. 10—(job's tear.)

Southern.

Zea. Staminate flowers—calyx-glume 2-flowered, awnless: corolla-glume awnless. Pistillate flowers—calyx glume 2-valved, (number of valves increased by cultivation:) style 1, very long, filiform, pendulous: seed solitary, immersed in an oblong receptacle. 4. 10—(indian corn.)

Order 4. Tetrandria.

Alnus. Staminate flowers—ament composed of wedge-form, truncate, 3-flowered receptacles: calyx a scale, 3-lobed; corolla 4-parted. Pistillate flowers—calyx 2-flowered scales, somewhat 3-cleft: corolla 0: seed compressed ovate, wingless. 50. 99—(alder.) *S.*

Ur″tica. Staminate flowers—calyx 4-leaved; corolla 0: nectary central, cyathiform. Pistillate flowers—calyx 2-leaved, (2-valved:) corolla 0: seed 1, glossy. 53. 98—(nettle.) *S.*

Morus. Staminate flowers—calyx 4-parted: corolla 0: Pistillate flowers —calyx 4-leaved: corolla 0: styles 2, calyx becoming berry-like: seed 1. 53. 98—(mulberry.) *S.*

Order 5. Pentandria.

Amaran″thus. Staminate flowers—calyx 3 or 5-leaved: corolla 0: stamens 3 or 5. Pistillate flowers—calyx and corolla as the staminate: styles 3: capsule 1-celled, opening transversely: seed 1. 54. 30—(amaranth, red cockscomb.) *S.*

Ambro′sia. Staminate flowers—common calyx 1-leaved: anthers in contact but not united: corolla 1-petalled, 5-cleft, funnel-form: receptacle naked. Pistillate flowers—calyx 1-leaved, entire, the swelling part 5-toothed, 1-flowered; corolla 0; nut from the indurated calyx 1-seeded. 54. 98—(hog-weed.) *S.*

Order 12. *Polyandria.*

A. Stems not woody.

Sagitta′ria. Staminate flowers—calyx 3-leaved: corolla 3-petalled; filaments mostly 24. Pistillate flowers—calyx and corolla as in the staminate: germs many; capsules aggregate, 1-seeded, not opening. 5. 13—(arrow-head.) S.

Arum. Spatha cucullate, 1-leaved; spadix not entirely covered with the fructification; being more or less naked above, with pistillate flowers beneath, and staminate in the middle; (sometimes a few are staminate beneath; berry mostly 1-seeded, generally cirrose-glandular beneath.) 2. 7—(indian turnip, wake-robin.) S.

Calla. Spatha ovate, becoming expanded: spadix covered with the fructification: stamens intermixed. Staminate flowers—calyx and corolla 0: anthers sessile. Pistillate flowers—calyx and corolla 0: berries 1-celled, many seeded, crowned with the short style. 2. 7—(water arum.)

Euphor″bia. Involucrum perianth-like, inflated, with alternating petal-like segments. Staminate florets 12 or more, at the base of the stipe of the pistillate flower, each consisting of an anther united to a pedicel by a filament. Pistillate flower central, single, stiped; with 3 two-cleft styles: capsule 3-lobed. 38. 96—(caper, spurge.) S.

Exotic.

Pote′rium. Staminate flowers—calyx 4-leaved: corolla 4-parted: stamens 30 to 50. Pistillate flowers—calyx and corolla like the staminate: pistils 2: berry from the indurated tube of the corolla. 54. 92—(burnet.)

B. *Stems woody.*

Quercus. Staminate flowers—ament loose: calyx sub-5-cleft: corolla none: stamens 5 to 10. Pistillate flowers—calyx 1-leafed, entire, scabrous, being a woody cup: style one, stigma 2 to 5: nut or acorn 1-celled, 1 seeded, coriaceous, surrounded at the base by the permanent calyx. 50. 99—(oak.) *S.*

Cor″ylus. Staminate flowers—ament cylindric, imbricate: calyx a

3-cleft scale : pericarp none : stamens about 8. Pistillate flowers—calyx 2-parted, lacerated : stigmas 2 : nut ovate, surrounded by and included in the permanent leaf-like calyx. 50. 99—(hazlenut.) *S.*

Fagus. Staminate flowers—ament roundish : calyx 5 or 6-cleft, bell-form : stamens 5 to 12. Pistillate flowers—calyx 4-toothed, setose : germs 2 : nuts 2, inclosed in the calyx, becoming coriaceous echinate. 50. 99—(beech.) *S.*

Casta'nea. Polygamous. Staminate flowers—ament naked, linear : corolla (or calyx) 1-leaved, 5 or 6-parted : stamens 10 to 20. Pistillate flowers—calyx 5 or 6-leaved, (or 5 or 6-lobed)muricate ; germs 3 : stigma pencil-form : nuts 3, with coriaceous putamen, enclosed in the calyx, becoming echinate. 50. 99—(chesnut.) *S.*

Bet"ula. Staminate flowers—ament cylindric, imbricate, scales peltate, 3-flowered : stamens 10 to 12. Pistillate flowers—calyx a 2 or 3-flowered scale : seed 1, winged. 50. 99—(birch.) *S.*

Plat"anus. Ament globose. Staminate flowers—corolla none or scarcely apparent, anthers growing around the filaments. Pistillate flowers—calyx many-leaved : style with a recurved stigma : seed roundish, crowned with the mucronate style, with egret-like hairs at the base. 50. 99—(button-wood, false sycamore.) *S.*

Juglans. Staminate flowers—ament imbricate : calyx a scale, generally 5-parted : corolla 4 or 5-parted : stamens 18 to 36. Pistillate flowers—calyx 4-cleft, superior : corolla 4-cleft or 4-parted : styles 1 or 2 : drupe partly spongy : nut rugose and irregularly furrowed. 50. 94—(butternut, black walnut.) *S.*

Car"ya. Staminate flowers—ament imbricate : calyx, 3-parted scales : corolla 0 : stamens 4 to 6. Pistillate flowers—calyx 4-cleft, superior : corolla 0 : styles 0 : stigma disk-like, 4-lobed : pericarp 4-valved : nut sub-quadrangular, even. 50. 94—(hickory, walnut.) *S.*

Order 15. *Monadelphia.*

A. *Stems not woody.*

Momor"dica. Staminate flowers—calyx 5 or 6-cleft : corolla 5 or 6-parted : filaments 3. Pistillate flowers—style 3-cleft : berry gourd-like and bursting elastically : seeds compressed. 34. 97—(balsam apple, wild cucumber.)

Exotic.

Cuc"umis. Staminate flowers—calyx 5-toothed : corolla 5-parted : filaments 3. Pistillate flowers—calyx and corolla like the staminate : stigmas 3, thick, 2-parted : berry with sharpish seeds. 34. 97—(cucumber, musk-melon.)

Cucur'bita. Staminate flowers—calyx 5-toothed : corolla 5-cleft : filaments 3. Pistillate flowers—calyx and corolla like the staminate : pistil 3-cleft : pomaceous berry large, 3 to 5-celled : seeds thickened at the margin. 34. 97—(gourd, squash, pumpkin, water-melon.)

Rici'nus. Staminate flowers—calyx 5-parted : stamens numerous. Pistillate flowers—calyx 3-parted : styles 3, 2-cleft : capsules echinate, 3-celled, 3-seeded. 38. 96—(palma christi, or castor oil plant.)

B. *Stems woody.*

Pinus. Staminate flowers—calyx 4-leaved, peltate : corolla 0 : stamens many : anthers naked, 2, sessile, 1-celled. Pistillate flowers—calyx in strobiles or cones, scales closely imbricate, 2-flowered : pistil 1 : nut with a membranaceous wing. (Perhaps more properly a samara.) 51. 100—(pine.) *S.*

Cupres"sus. Staminate flowers—ament ovate, imbricate : calyx a peltate scale : corolla 0 : anthers 4, sessile. Pistillate flowers—ament strobilaceous : calyx a 1-flowered peltate scale ; corolla 0 : germs 4 to 8, under each scale of the calyx : nuts angular, compressed. 51. 100—(white cedar.) *S.*

CLASS XX. DIOECIA.

Order 2. *Diandria.*

Salix. Staminate flowers—ament cylindric: calyx a 1-flowered scale, with a nectariferous gland at the base: stamens 1 to 6. Pistillate flowers—ament and calyx like the staminate: stigmas 2: generally 2-cleft: capsule 1-celled, 2-valved: seeds many, with egret-like down. 50. 99—(willow.) *S.*

Frax″inus. Polygamous. Perfect flowers—calyx 0, or 3 or 4-parted: corolla 0, or 4-petalled: pistil 1: samara 1-seeded, with a lanceolate wing. Pistillate flowers—calyx, corolla, and pistils same as perfect. 44. 37—(ash.) *S.*

Order 3. *Triandria.*

Exotic.

Ficus. Common receptacle fleshy, (becoming the fruit,) enclosing the apetalous florets; both staminate and pistillate, either in the same, or in distinct individuals. Staminate flowers—calyx 3-parted. Pistillate flowers—calyx 5-parted: pistil 1, lateral: seed 1, covered with the closed, permanent, somewhat fleshy calyx. 53. 98—(fig-tree.)

Order 4. *Tetrandria.*

Viscum. Staminate flowers—calyx 4-parted: corolla 0: anthers sessile, adhering to the calyx. Pistillate flowers—calyx 4-leaved, superior: corolla 0; style 0: berry 1-seeded, globose; seed cordate; (parasitic, adhering to trees,) 43. 58—(misseltoe.) *S.*

Order 5. *Pentandria.*

Zanthox″ylum. Staminate flowers—calyx 5-parted; corolla 0; stamens 3 to 6. Pistillate flowers—pistils 3 to 5; capsules equal to the number of pistils, 1-seeded. 46. 94—(prickly ash, or tooth-ache tree.) *S.*

Hum″ulus. Staminate flowers—calyx 5-leaved; corolla 0; anthers with 2 pores at the extremity. Pistillate flowers—calyx 1-leafed, entire, oblique, spreading; styles 2; seed 1, within the leaf-like calyx; inflorescence strobileform. 53. 98—(hop.) *S.*

Exotic.

Can″nabis. Staminate flowers—calyx 5-parted. Pistillate flowers—calyx 5-leaved, entire, gaping laterally; styles 2; nut 2-valved, within the closed calyx. 53. 98—(hemp.)

Spina'cia. Staminate flowers—calyx 5-parted; corolla 0. Pistillate flowers—styles 4; seed 1, within the indurated calyx. 12. 29—(spinach.)

Order 6. *Hexandria.*

Smi'lax. Staminate flowers—calyx 6-leaved; corol 0; anthers adnate to the filaments. Pistillate flowers—style minute; stigmas 3; berry 3-celled, superior, 1—3-seeded. 11. 12—*S.*

Order 8. *Octandria.*

Po'pulus. Staminate flowers—ament cylindric, calyx a torn scale: corolla turbinate, oblique, entire, supporting 8 to 30 stamens. Pistillate flowers—ament, calyx and corolla like the staminate: stigma 4 or 6-lobed: capsule 2-celled, 2-valved, many-seeded: seed with egret-like hairs. (Leaves having a tremulous motion.) 50. 99—(poplar, balm of Gilead.) *S.*

Order 12. *Polyandria.*

Menisper″mum. Staminate flowers.—Calyx 2-bracted, about 6-leaved, caducous; petals 6—9, glandular, minute, retuse; stamens 16—24; anthers adnate to the filaments, 4-lobed, 2-celled. Pistillate flowers—Germs and styles. 3—6: drupes mostly solitary, 1-seeded; nut lunate, compressed. .11. 77. *S.*

CLASS XXI. CRYPTOGAMIA.

Order 1. *Filices.*

A. *Capsule having an elastic ring at right angles with its opening.*

Polypo'dium. Capsules disposed in round scattered fruit dots, (or clusters of capsules,) on various parts of the lower surface of the frond: involucrum none. 55. 5—(polypod.) *S.*

Aspid″ium. Capsules in scattered roundish fruit-dots on various parts of the whole lower surface of the frond: involucrum a kidney-form or round membrane, fastened to the frond in or near the centre of the fruit-dot, and opening on all sides, or to one side of the fruit-dot, and opening on the other. (The involucrum, when a little opened, is often peltate.) 55. 5—(shield-fern.) *S.*

Pteris. Capsules arranged in a continued line along the very margin of the frond: involucres opening inwards, being formed of the inflexed margins of the fronds. (When the leaves are extremely small, the rows of capsules on opposite sides meet and cover the lower surface.) 55. 5—(brake.) *S.*

Adian″tum. Capsules disposed in oblong fruit-dots, arranged along the margin of the frond; involucrum is formed by turning back the margin of the frond over the capsules, and it opens inwards. (The lines of oblong spots are generally along that margin, which may be considered the end of the leaf, or of the segments of the leaf.) 55. 5—(maidenhair.) *S.*

Onocle′a. Fruit-dots indeterminate, presenting a berry-like appearance; capsules covering the whole lower surface of the frond: involucrum formed by turning in or rolling back the margin of the leaf, which opens inwards, in maturity, towards the midrib, or remains closed. The fertile leaves are contracted and narrower than the barren ones. 55. 5—(sensitive polypod.) *S.*

B. *Capsule without a ring—being cellular-recticulate, pellucid, sub-striate, radiate at the tip.*

Osmun″da. Capsules globose, pedicelled, radiate-striate or wrinkled, having a hinge at the joining of the two valves, which resembles part of the jointed ring of annulated ferns: the capsules either occupy the whole frond, to a limited extent, or a pannicled raceme. (The parts of the frond occupied by the fruit are always more contracted than the barren parts.) 55. 5—(flowering fern.) *S.*

D. *Sub-order,* Apteres—*without pinnate, pinnatifid, or other winged leaves.*

Lycopo′dium. Capsules mostly kidney-form, or roundish, 2 or 4-valved, opening elastically; they are placed under separate scales in a spike, or sometimes in the axils of the leaves. Leafy, their stems being generally covered with 2, 3, or 4 rows of narrow, simple, entire leaves. 55. 5—(ground-pine.) *S.*

Equise′tum. Fruit placed under peltate polygons, being pileus-like bodies, which are arranged in whorls, forming a spike-form raceme; 4 to 7 spiral filaments surround the seed (probably,) which resemble green globules. (Fertile plants mostly leafless; the stems of all are jointed with toothed sheaths at every joint, and usually longitudinally striated and hollow. 55. 5—(scouring rush, horsetail.) *S.*

*Order 2. Musci.**

Funa′ria. Teeth of the outer peristome 16, cohering together at the apex, and twisted obliquely; the inner peristome consists of 16 membranaceous cilia, opposite to the teeth, lying flatly. 56. 4.

Polytri′chum. Peristome very short; teeth 16, 32, or 64: mouth of the germ covered by a dry membrane, which is connected to it by the teeth of the peristome: calyptre very small, with a large villose or hairy covering. 56. 4.

Order 3. Hepaticæ.

Marchan″tia. Receptacles pedicelled, radiate-lobed, disk-like or bell-form, with the inside downwards, to which the globose 4-valved capsules are attached, with their apexes downwards. The umbrella-like receptacle is elevated one or two inches by a stipe attached to the centre of its lower side, among the capsules and many pilose appendages. The frond is leafy, reticulate, furnished with a midrib, and beset with villose roots on the under side, which attach themselves to the stones in brooks, to damp earth, &c. 57. 3.

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* Mosses may be gathered whenever the capsules have arrived to their usual size; but they must be put in a closet, until the lids of the capsule become reddish-brown, before they are examined; then the lids may be removed, and the teeth examined.

Jungerman"nia. Capsules 4-valved, globose, elevated by peduncles or stipes from within a bell-form calyx. The fronds are made up of finer leaves than those of the Marchantia, and are often mistaken for mosses, among which they generally grow. 57. 3.

Order 4. *Algæ.*

A. *The section* Fucoideæ *comprises those sea-weeds of the old genus Fucus, whose fronds are cartilaginous or leathery, and of an olive or copper colour, becoming brown or black. They are composed of interwoven longitudinal fibres. The floating vesicles appear like portions of the frond blown up in bubbles.*

Fucus. Receptacles tubercled; tubercles perforated, nourishing aggregated capsules within, intermixed with articulated fibres. 57. 2.

B. *The section* Florideæ *comprises those sea-weeds of the old genus Fucus, whose fronds are leathery, membranous or gelatinous, and of a purple or rose colour.*

Halyme'nia. Frond membranaceous, leathery, nerveless, punctate: seed immersed throughout the whole frond, disposed in spots. 57. 2.

C. *The sections* Ulvoideæ *comprises the plants of the old genus Ulva. Fronds membranaceous,* (broad, or in narrow slips,) *thin, of a grass-green colour. Their substance consists of cells, with the fruit immersed in the frond.* They grow on rocks, stones, shells, &c. in the sea; also in ditches, stagnant waters, damp woods, &c. 57. 2.

Ulva. Seeds in fours, immersed in every part of the membranaceous frond. 57. 2.

D. *The sections* Confervoideæ *comprises the plants of the old genus Conferva. Fruit capsular or naked granulations. Fronds filiform and geniculate, containing the fruit immersed in them, generally strung on threads; mostly of a grass-green or greenish colour, sometimes purple.* They grow in fresh water streams, springs, ditches, and stagnant waters; sometimes in damp woods, and some in the sea.

Confer"va, Filaments articulated, uniform, simple or branched; containing the seed within them. No external fruit. 57. 2.

E. *The section* Tremellinæ *comprises the old genus Tremella. Plants of this section are all gelatinous, hyaline, and covered with a membrane. They are globose, palmate, or filiform; and contain conferva-like filaments within. Colour green or purplish. They resemble Canfervoideæ in habit and place of growth.*

Nostoc. Filaments monili-form, constituted from coadunate globules. Frond bullate, vesicular, (at length becoming flattened,) crowded with simple monili-form, curve-crisped filaments. 57. 2.

Order 5. *Lichenes.*

Gyroph"ora. Frond foliaceous, coriaceous-cartilaginous, peltate, monophyllous, (when luxuriant, polyphyllous,) free beneath: receptacles (buttons) somewhat shield-form, sessile-adnate, clothed with a dark membranaceous cartilage, including a somewhat solid parenchymous substance; disk warty or circinal, plicate and margined. 57. 2.

Parme'lia. Frond coriaceous, sub-membranaceous, flat, expanded, closepressed, orbicular, stellate and lobed, or multifid-laciniate, having fibres beneath: receptacle shield-form, sub-membranaceous, formed under-side from the frond, free, with a central puncture by which it is affixed : seed-bearing lamina forming the disk, concave, coloured, covering the whole receptacle above, within similar, sub-cellular and striate, cut round, inflexed with a frond-like margin. 57. 2.

Cetra'ria. Frond cartilaginous or membranaceous, ascending or expanded ; lobe-laciniate, smooth and naked both sides ; receptacles (targets) shield-like obliquely attched to the margin of the frond, the lower free, being separated from it, the upper one sessile ; seed-bearing lamina forming the disk, coloured, plano-concave, within similar or cellular-striate, surrounded with a frond-like inflexed margin. 57. 2.

Cenomy'ce. Frond crusty or cartilaginous, foliaceous, laciniate, subimbricate free, (rarely adnate ;) bearing sub-fistulous peduncles (*podetia*,) both barren and fertile : receptacles (knobs) orbicular, without margins, at length convex and capitate, inflated or empty beneath, terminal attached to the peduncles by their peripheries : seed-bearing lamina forming the receptacle above thickish, coloured, similar within, convex, reflexed and attached at the periphery, invested beneath with the woolly integument of the frond. 57. 2.

Bæmy'ces. Frond crustaceous, flat, expanded, adnate ; bearing soft, solid, fertile peduncles (*podetia* :) receptacles (knobs) capitate, without margins, solid, terminal, sessile on the peduncles ; seed-bearing lamina covering the whole receptacle and adnate to it, convex-reflexed, thickish, coloured, similar within. 57. 2.

Us"nea. Frond sub-crustaceous, teretish, branched, mostly pendulous ; central part hyaline, elastic composed of fascicles of tubes : receptacles orbicular, terminal, peltate, formed wholly from the frond, covered all over with its cortical substance, similar, nearly of an uniform colour ; its periphery destitute of margin, but often surrounded by a ciliate edging. 57. 2.

Order 6. *Fungi.*

Lycoper"don. Receptacle somewhat caulescent, at length bursting at the top, with scaly warts or prickles scattered over its surface, especially when young. Seminal dust green. 58. 1.

Mucor. Receptacle membranaceous, globose, stiped, at first watery and pellucid, then opake ; seeds naked, sub-cohering. Very minute and fugacious. 58. 1.

Ure'do. Receptacle none ; seminal dust under the cuticle of leaves and stems, when ruptured it is easily brushed off ; the little masses of seeds uniform, mostly globose. 58. 1.

Agar"icus. Destitute of a volva at the base of the stipe, with or without the ring ; lamellae either entire or with shorter ones intermixed, rarely simply ramose. Never veiny. A vast genus. Persoon describes 447 species, which occupy one third of his work on Fungi. 58. 1.

Bole'tus. Pileus various ; tubes and pores terete, entire. A large genus. Persoon describes 83 species. 58. 1.

SPECIES OF PLANTS.

☞ A number at the end of a specific description denotes the average height of the plant in the wild state—in feet with f. in inches with i.

A.

8—1. ACER. 23. 66.

rubrum, (red maple, soft maple. O. r. Ap. ♄.) leaves palmate, 5-lobed, cordate at the base, unequally gash-toothed, glaucous beneath, dividing incisions between the lobes acute: flowers in fives in sessile umbels, with long pedicels; germs glabrous. 50 f. *S.*

sacchari'num, (sugar maple, rock maple, hard maple, O. r-y. M. ♄.) leaves palmate 5-lobed, at the base sub-cordate, acuminate, obtusely sinuate, sinuate-toothed, glaucous beneath: peduncles in a nodding corymb. Large tree. 50 f. *S.*

stria'tum, (striped maple, false dogweed, moose-wood. O. g. M. ♄.) lower leaves roundish, upper ones 3-cuspidate-acuminate, sharply serrate, glabrous: racemes simple, pendant. Small tree, with a greenish-striped bark. 15 f. *S.*

17—2. ACHILLEA. 49. 55.

millefo'lium, (yarrow, milfoil. O. w. J. ♃.) leaves 2 pinnatifid, downy: the divisions linear, toothed, mucronate: calyx and stem furrowed. 15 i. *S.*

12—5. ACONITUM. 26. 61.

uncina'tum, (monk's hood. b. J. ♃.) stem flexuose: leaves palmate, 3 to 5-parted; divisions rhomb-lanceolate, gash-toothed: upper lip of the corolla lengthened, convex, beaked. Cultivated. 2 f. *S.*

Exotic.

napel"lus, (wolf's bane. b. J. ♃.) leaves shining, 5-parted; the divisions 3-parted by gashed incisions, sub-divisions linear: upper lip of the corolla lanceolate, ascending, 2-cleft; spur strait, obtuse. 2 f.

6—1. ACORUS. 2. 13.

cal"amus, (sweet flag, calamus. O. g-y. J. ♃.) spike protruding from the side of a sword-form leaf-like scape. Water or wet. Root strongly aromatic. 2 f. S.

12—1. ACTÆA. 26. 61.

america'na, (bane-berry. 6. w. ♃.) leaves twice and trice ternate; racemes ovate: petals shorter than the stamens; berries ovate-oblong. Var. 1. *alba*, petals truncate: pedicels of the fruit thicker than the peduncle; berries white, Var. 2. *rubra*, petals acute, pedicels of the fruit slender: berries red. 2 ft.

21—1. ADIANTHUM. 55. 5.

peda'tum, (maiden hair. O. J. ♃.) frond pedate, with pinnate branches, leafets halved, upper margin gashed—barren segments toothed, fertile ones entire: stipe capillary, very glabrous. Woods. 1 f. S.

12—13. ADONIS. 26. 61.

Exotic.

autumna'lis, (pheasant's eye. Au. ☉.) flowers 5 to 8-petalled; fruit subcylindric: petals erose, or emarginate.

7—1. AESCULUS. 23. 66.

Exotic.

hippocas''tanum, (horse-chesnut. w. J. ♄.) leaves digitate, with about 7 divisions: corolla 5-petalled, spreading: flowers in a panicled pyramid. 15 f.

5—2. AETHUSA. 45. 60.

Southern.

divarica'ta, (E. w. ☉.) stem erect, slender: leaves biternate; segments narrow linear: umbels terminal, without involucre's; partial umbels 3 to 5-flowered: fruit hispid.

21—6. AGARICUS. 38. 12.

campes''tris, pileus fleshy, flattish, having dark-yellow scales; lamellæ becoming yellowish-red; stipe short; the ring-volva rather incomplete. This is the common eatable mushroom.

11—2. AGRIMONIA. 35. 92.

eupato'ria, (agrimony. O. y. Ju. ♃.) cauline leaves interruptedly pinnate, the terminal leafet petioled: leafets obovate, gash-toothed, almost glabrous: flowers sub-sessile; petals twice as long as the calyx; fruit hispid. 2 f. S.

10—5. AGROSTEMMA. 22. 82.

githa'go, (cockle. O. r. J. ☉.) hirsute; calyx longer than the corolla; petals entire. S.

3—2. AGROSTIS. 4. 10.

vulga'ris. (red-top. O. J. ♃.) panicle with smoothish branches, spreading in maturity; outer valve of the corolla 3-nerved; stipule short, truncate. 18. i.

alba, (white-top, bonnet grass. O. J. ♃.) panicle with hispid, spreading, lax-branches; outer valve of the corolla 5-nerved; stipule oblong. 18 i. Var. *decumbens*, (fiorin grass,) stem decumbent. This variety is considered as a distinct species by some, and called *stolonifera*. S.

6—13. ALISMA. 5. 13.

plantago, (water plantain. 6. w. Ju. ♃.) leaves ovate-cordate, acute or obtuse, 9-nerved; flowers in a compound verticillate panicle; fruit obtusely triangular. Var. *parviflora*, flowers very small; leaves oval, 5—7-nerved, acuminate.

6—1. ALLIUM. 9. 16.

Exotic.

cepa, (garden onion. Ju. ♃.) scape naked, swelling towards the base, longer than the terete leaves.

schœnopra'sum, (cives. Ju. ♃.) scape naked, equalling the leaves which are terete-filiform.

19—4. ALNUS. 50. 99.

serrula'ta, (alder. O. r.-g. Ap. ♄.) leaves obovate, acuminate; veins and their axils hairy beneath; stipules oval, obtuse. 9 f. S.

15—13. ALTHAEA. 37. 74.

officina'lis, (marsh-mallows. ♃.) leaves downy, oblong-ovate; obsoletely 3-lobed, toothed.

Exotic.

ros''ea, (hollyhock. ♂.) stem erect; leaves rough, heart-form, 5 to 7-angled; crenate.

19—5. AMARANTHUS. 54. 80.

albus, (white coxcomb. g-w. Ju. ⊙.) glomerules axillary, triandrous; leaves obovate, retuse; stem 4-cornered, simple. Common garden weed.

Exotic.

melanchol''icus, (love-lies-bleeding. r. ⊙.) glomerules axillary, peduncled, roundish; leaves lance-ovate, coloured.

6—1. AMARYLLIS. 9. 17.

atamas''co, (atamasco lily. w. & r. J. ♃.) spatha 2-cleft, acute; flower pedicelled: corolla bell-form, sub-equal, erect; stamens declined.

Exotic.

formosis''sima, (jacobea. ♃.) spatha 1-flowered: corolla ringent like; petals declined.

19—5. AMBROSIA. 54. 98.

ela'tior, (hogweed. O. S. ⊙.) leaves doubly pinnatifid, smoothish; petioles long, ciliated; racemes terminal, panicled; stem wand-like. S.

16—10. AMORPHA. 32. 93.

frutico'sa, (E. Ju. ♄) smooth, sub-arborescent: leaves petioled, emarginate: spikes aggregated, long: calyx hoary, pedicelled, one of the teeth acuminate, the rest obtuse: legume few-seeded. *S.*

5—1. AMPELOPSIS. 46. 72.

quinquefo'lia,* (O. g— to Ju. ♃) stem climbing and rooting leaves quinate-digitate, smooth; leafets petiolate, oblong, acuminate, toothed: racemes dichotomous. Var. *hirsuta*, leaves pubescent on both sides; leafets ovate, coarsely toothed.

16—10. AMPHICARPA. 32. 93.

mono'ica, (wild bean-vine. O. b. & w. Ju. ⊙.) stem slender, twining, hairy backwards: leaves ternate, ovate nearly, smooth; stipules ovate, striate. Var. *comosa*, has hirsute leaves. Twining. 4 f.

11—1. AMYGDALUS. 36. 92.

Exotic.

per''sica, (peach. r. M. ♄.) cerratures of the leaves all acute, flowers sessile, solitary. 15 f.

nana, (flowering almond. ♄.) leaves ovate, tapering to the base, sharply serrate. 3 f.

5—1. ANAGALLIS. 20. 34.

arven''sis, (red chickweed, scarlet pimpernel. r. J. ⊙.) stem spreading, naked, procumbent: petals entire, flat, with hairs at the margin. *S.*

5—1. ANCHUSA. 41. 42.

Exotic.

officina'lis, (bugloss. y. ♃.) leaves lanceolate: spikes imbricate, one-sided: bracts ovate.

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* Cissus hederacea of Persoon.

10—1. ANDROMEDA. 18. 51.

calyculat"a, (leather leaf. O. w. M. ♄.) leaves lanceolate-oblong, obsoletely serrulate, sub-revolute, with scaly dots, rust coloured beneath: racemes terminal, leafy, turned one way: pedicels short, solitary, axillary: calyx acute, 2-bracted at the base: bracts broad-ovate, acuminate: corolla oblong-cylindric. Wet. 2 f. *S.*

12—13. ANEMONE. 26. 61.

virginia'na, (wind-flower. O. g-w. Ju. ♃.) stem dichotomous; leaves in threes, ternate, upper ones opposite; leafets gash-lobate and serrate-acute; peduncles solitary, 1-flowered, elongated; seed oblong, woolly, mucronate, in heads. 18 i. *S.*

nemoro'sa, (low anemone. O. r-w. M. ♃.) stem 1-flowered: cauline leaves in threes, ternate; leafets wedge-form, gash-lobed, toothed, acute: corolla 5-6-petalled: seeds ovate, with a short style, hooked. A variety, *quinquefolia*, has lateral leafets deeply 2-cleft. 6 i. *S.*

thalictro'ides, (rue anemone. O. w. M. ♃.) umbels involucred: radical leaves twice ternate, leafets sub-cordate, 3-toothed: involucrum 6-leaved; leafets petioled, uniform: umbel few-flowered: seed naked, striate: root tuberous. A variety, *uniflora*, has a 1-flowered involucrum. 6 i. S.

Exotic.

horten"sia, (garden anemone.) radical leaves digitate: divisions 3-cleft; cauline ones ternate, lanceolate, connate, subdivided: seed woolly.

5—2. ANETHUM. 45. 60.

Exotic.

grave'olens, (dill.) fruit compressed: plant annual.

fœni"culum, (fennel.) fruit ovate: plant perennial.

5—2. ANGELICA. 45. 60.

atropurpu'rea, (angelica. O. g-w. J. ♃.) stem smooth, coloured: leaves ternate, partitions sub-quinate; leafets ovate, acute, gash-serrate, sub-lobed; 3 terminal ones confluent: petioles very large, inflated. Wet meadows. Root purplish. This is the true aromatic angelica. 4 f. S.

Exotic.

archangel"ica, (archangel. ♂.) leaves with the odd terminal leafet lobed.

17—2. ANTHEMIS. 49. 55.

cot'ula, (mayweed. O. w. J. ☉.) receptacle conic, chaff bristly, seed naked: leaves 2-pinnate, leafets subulate, 3-parted. 10 i. S.

Exotic.

no'bilis, (chamomile. w. Au. ♃.) leaves 2-pinnate; leafets 3-parted, linear-subulate, sub-villous: stem branching at the base. Fragrant. 4 i.

2—2. ANTHOXANTHUM. 4. 10.

odora'tum, (sweet vernal grass. O. M. ♃.) spike oblong-ovate; florets sub-peduncled, shorter than the awn. An American variety, *altissimum*, is larger and of a dark green. An elegant substitute for the Leghorn grass. 10—18 i. S.

13—2. ANTIRRHINUM. 40. 40.

lina'ria, (snap-dragon. y. Ju. ♃.) erect, glabrous: leaves scattered, lanceolate-linear, crowded together: spikes terminal, dense-flowered: calyx glabrous-shorter than the spur. Flowers large—(toad-flax.) Naturalized. 12—18 i.

16—10. APIOS. 32. 93.

tubero'sa, (ground-nut. O. dark p. Ju. ♃.) stem twining: leaves pinnate, with 7 lance-ovate leafets: racemes shorter than the leaves: root tuberous farinaceous, in taste resembling the cocoa-nut, and highly nutricious. This plant should be cultivated in moist rich soil, for food.

5—2. APIUM. 45. 60.

Exotic.

petroseli'num, (parsley. Ju. ♂.) cauline leaves linear: involucrum minute.
grave'olens, (celery. Ju. ♂.) stem channelled: cauline leaves wedge-form.

18—5. APOCYNUM. 30. 47.

androsæmifo'lium, (dog-bane. O. r-w. J. ♃.) stem erect and branching; leaves ovate: cymes lateral and terminal: tube of the corolla longer than the calyx, with a spreading limb. 3 f. *S.*
cannab''inum, (O. g-y. J. ♃.) leaves lanceolate, acute, at each end, smooth on both sides: cymes paniculate: calyx as long as the tube of the corol.

12—5. AQUILEGIA. 26. 61.

canaden'sis, (wild columbine. O. r. & y. Ap. ♃.) horns straight: stamens exsert. leaves decompound. Growing frequently in crevices of rocks. 15 i.

Exotic.

vulga'ris, (garden columbine. J. ♃.) horns incurved: leafy; stem and leaves glabrous; leaves decompound. The nectariferous horns become numerous by culture; one hollow horn within another. 15 i.

14—2. ARABIS. 39. 63.

lyra'ta, (w. A. ♂.) stem and upper leaves smooth and glaucous: radical leaves lyrate-pinnatifid, often pilose: stem branched at the base; pedicels much longer than the calyx. 10 i.
canaden''sis, (O. w. J. ♃.) stem leaves sessile, oblong-lanceolate, narrow at the base, pubescent: pedicels pubescent, reflexed in the fruit: siliques pendalous, sub-falcate, nerved. 2 f. *S.*
rhombo'idea, (spring cress. O. w. M. ♃.) leaves glabrous, rhomboidal, repand toothed, the lower ones nearly round, on long petioles; root tuberous. 15 i. Wet. *S.*

5—5. ARALIA. 46. 59.

racemo'sa, (spikenard. O. w. J. ♃.) spreading branches: petioles 3-parted, the partitions 3—5-leaved; leafets often heart-form; branchlets axillary, leafy: umbels many, sub-panicled, leafless above. Damp. 4 f.
nudicau'lis, (O. g-w. J. ♃.) stem hardly a caulis: leaf solitary, terquinate: scape shorter than the leaf: umbels few. *S.*

10—1. ARBUTUS. 18. 51.

uva-ur''si, (bear-berry, kinnikinnick. O. w-r. M. ♄.) stem procumbent: leaves wedge-obovate, entire: berry 5-seeded. Dry, barren sand plains, &c. Very abundant about the great lakes.

17—1. ARCTIUM. 49. 54.

lappa, (burdock. O. r. Au. ♃.) cauline leaves heart-form, petioled, toothed flowers panicled, globose: calyx smooth.

10—3. ARENARIA. 22. 82.

1. *Leaves oblong.*

lateriflor''a, (sand-wort. O. w. J. ♃.) stem filiform, simple: leaves ovate, obtuse, sub-triple-nerved: peduncles lateral, solitary, elongated, 2-cleft; one pedicel middle-bracted; corolla longer than the calyx. 6—10 i.

18—1. ARETHUSA. 7. 21.

bulbo'sa, (arethusa. O. r. J. ♃.) leafless: root globose; scape sheathed, 1-flowered; calyx with the superior divisions incurved; lip sub-crenulate, Flowers large, sweet-scented. Damp.

18—6. ARISTOLOCHIA. 11. 23.

serpenta'ria, (O. p. J. ♃.) leaves heart-form, oblong, acuminate; stem zigzag, ascending; peduncles radical; lips of the corolla lanceolate. (the virginia snake-root.) There is a variety with very long, narrow leaves.

11—1. ARMENIACA. 36. 92.

Exotic.

vulga'ris, (apricot. ♄.) leaves sub-cordate; stipules palmate, Var. *precox*, (early apricot.) fruit small, yellow. Var. *persicoides*, (peach apricot.) fruit sub-compressed.

11—5. ARONIA. 36. 92.

botrya'pium, (shad-bush, june-berry. O. w. Ap. ♄.) leaves oblong-oval, cuspidate, glabrous when mature, (when first expanded lanceolate and downy;) flowers racemed; petals linear; germs pubescent; segments of the calyx glabrous.

17—2. ARTEMESIA. 49. 55.

Exotic.

pon"tica, (roman artemisia.) leaves downy beneath; cauline ones bipinnate; leafets linear; branches simple; flowers roundish, peduncled, nodding.

absynth"ium, (wormwood. ♃.) stem branching, panicled; leaves hoary; radical ones triply pinnatifid; divisions lanceolate, toothed, obtuse; cauline ones 2-pinnatifid or pinnatifid; divisions lanceolate, acutish; floral ones undivided, lanceolate. Naturalized in the most mountain districts of New-England.

abrota'num, (southern-wood. ♃. & ♄.) stem straight; lower leaves bipinnate; upper ones hair form, pinnate; calyx pubescent, hemispheric.

19—12. ARUM. 2. 7.

triphyl"lum, (indian turnip, wild turnip, wake robin. O. p. g. & w. M. ♃.) subcaulescent; leaves ternate; leafets ovate, acuminate, spadix club-form; spatha ovate, acuminate, peduncled with the lamina as long as the spadix. One variety, *virens*, has a green spatha; another, *atropurpureum*, has a dark-purple spatha; another, *album*, has a white spatha. 1—3 f.

3—2. ARUNDO. 4. 10.

canaden"sis, (E. Au. ♃.) panicle oblong, loose; glumes scabrous, pubescent, as long as the corolla; corolla awned on the back; hairs at the base equalling the valves: culm and leaves smooth. 3—4 f.

18—12. ASARUM. 11. 23.

canaden"se, (white snake-root, wild ginger. O. g-p. M. ♃.) leaves broad-reniform, in pairs; calyx woolly, deeply 3-parted; the segements sub-lanceolate, reflexed. *S.*

18—5. ASCLEPIAS, 30. 47.

1. *Leaves opposite.*

syri'aca, (common milkweed. O. w-p. Ju. ♃.) stem very simple; leaves lanceolate-oblong, gradually acute, downy beneath; umbels sub-nodding, downy, 3 to 5 feet high; flowers in large, close clusters, sweet-scented—pollinia are fly-traps. 3—5 f. *S.*

incarna'ta, (O. r. Ju. ♃.) stem erect, branching above, downy; leaves lanceolate, sub-downy both sides; umbels mostly double at their origin; the little horn of the nectary exsert. A variety pulchra is more hairy. Var. *glabra*, almost glabrous. Var. *alba*, has white flowers. Damp. 3 f. *S.*

quadrifo'lia, O. w. p-w. M. ♃.) stem erect, simple, glabrous; leaves ovate, acuminate, petioled; those in the middle of the stem are largest, and in fours; umbels 2, terminal, lax-flowered; pedicels filiform. About 18 inches high; flowers small and sweet-scented. *S.*

2. *Leaves not opposite.*

verticilla'ta (dwarf milkweed. O g-y. w. Ju. ♃.) stem erect, very simple, marked with lines, and small pubescence; leaves very narrow-linear, straight, glabrous, whorled, scattered; horn in the nectary exsert. 2 f. *S.*

6—1. ASPARAGUS. 11. 12.

Exotic.

officina'lis, (asparagus. Ju. ♃.) stem herbaceous, unarmed, sub-erect, terete; leaves bristle-form, soft; stipules sub-solitary. Naturalized in the northern and southern districts. 4 f.

6—1. ASPHODELUS. 10. 16.

Exotic.

lu'teus, (asphodel, king's spear. ♃.) stem leafy; leaves 3-sided, striate.

21—1. ASPIDIUM. 55. 5.

margina'le, (O. Ju. ♃.) front doubly-pinnate; lesser leafets oblong, obtuse, decurrent, crenate: more deeply crenate at the base; fruit dots marginal; stipe chaffy. 2—3 f. *S.*

17—2. ASTER. 49. 55.

1. *Leaves entire.*

rig''idus, (p. y. Au. ♃.) leaves linear, mucronate, sub-carinate, rigid; margin rough-ciliate; the cauline leaves reflexed; the branch ones spreading, subulate; stem erect, somewhat branched above; branchlets 1-flowered, corymbed; calyx imbricate, twice as short as the disk; scales obtusish, carinate; rays about 10-flowered, reflexed. Hardly a foot high. *S.*

linariifo'lius, (O. p y. Au. ♃.) leaves thick-set, nerveless, linear, mucronate, dotted, carinate, rough, stiff, those on the branches recurved; stem sub-decumbent; branches level-topped, 1-flowered; calyx imbricate, of the length of the disk; stem rough, purplish. *S.*

multiflo'rus, (O. w-y. Au. to Nov. ♃.) leaves linear, smoothish; stem very branching, diffuse, pubescent; branchlets one-way: calyx imbricate: scales oblong, scurvy, acute. *S.*

flexuo'sus,(L. O. y. w-p. Au. ♃.) very glabrous: leaves subulate linear, somewhat fleshy, sub-reflexed stem slender, very braching: branches and branchlets spreading, bristle-form, 1-flowered: scales of the peduncles divaricate, subulate; calyx imbricate, scales close-pressed, acute. Salt marshes. *S.*

cornifo'lius, (O. w. Au. ♃.) glabrous; leaves oblong-ovate, acuminate, short-petioled; margin rough; stem glabrous; panicle few-flowered; branches 2-flowered; calyx sub-imbricate.

amygdali'nus, (O. w. S. ♃.) leaves lanceolate, tapering to the base, acuminate: margin rough; stem simple, level-top-corymbed at the top: calyx lax-imbricate; scales lanceolate, obtuse. Rays large. *S.*

nova-ang''liæ, (O. b-p. Au. ♃.) leaves linear-lanceolate, pilose, clasping, auricled at the base; stem sub-simple, pilose, straight and stiff; flowers sub-sessile, terminal, crowded; scales of the calyx lax, coloured, lanceolate, longer than the disk. In rich soil it grows 10 feet high; flowers large. *S.*

cya'neus, (O. b-p. Au. ♃.) leaves linear-lanceolate, clasping, smooth;

stem wand-like-panicled, very glabrous; branches racemed; scales of the calyx lax, lanceolate, equalling the disk, inner ones coloured at the apex. 3—4 f. Flowers many and large. This is the handsomest of all asters. *S.*

2. *Leaves more or less cordate and ovate, serrate, or toothed.*

diversifo'lius, (E. y. p. S. ♃.) leaves nearly entire, undulate, pubescent, sub-scabrous; lower ones cordate, ovate, with winged petioles; upper ones lance-oblong: panicle loose, the branches slender, racemose. 3 f. *S.*

panicula'tus, (O. b-p. Au. to Nov. ♃.) leaves ovate-lanceolate, sub-serrate, petioled, glabrous; radical ones ovate-heart-form, serrate, rough, petioled; petioles naked: stem very branching, glabrous; branchlets pilose: calyx lax, sub-imbricate. 2—4 f. Flowers smallish, numerous. *S.*

cordifo'lius, (O. w. S. ♃.) leaves heart-form, pilose beneath, sharp serrate, petioled; petioles winged: stem panicled, smoothish: panicles divaricate: calyx lax, sub-imbricate. Flowers small.

corymbo'sus, (O. w. Au. ♃.) leaves ovate, sharp-serrte, acuminate, smoothish; lower ones heart-form, petioled; petioles naked: stem glabrous, level-top-corymbed above: branches pilose: calyx oblong, imbricate: scales obtuse, very close-pressed. 12—14 i. Flowers rather large.

3. *Leaves lanceolate and ovate, lower ones serrate.*

amplexica'ulis, (O. b. S. ♃) leaves ovate-oblong, acute, clasping, heart-form, serrate, glabrous: stem panicled, glabrous; branchlets 1-2-flowered: scales of the calyx lanceolate, closely imbricate. Flowers middle-sized.

versic"olor, (y-w. Au. ♃) leaves sub-clasping, broad-lanceolate, sub-serrate, glabrous; radical ones serrate in the middle: stem very branching, glabrous: scales of the calyx lanceolate, lax, shorter than the disk. Flowers many and large, elegant. *S.*

tardiflo'rus, (b. Oc. ♃) leaves sessile, serrate, glabrous, spatulate-lanceolate, tapering to the base, deflected at the margin and both sides: branches divaricate: calyx lax, the leafets lanceolate-linear, sub-equal, glabrous. Flowers not middle size.

conyzo'ides, (O. w. Ju. ♃) leaves oblong, 3-nerved, narrow and acute at the base; upper ones sessile, sub-entire; lower ones petioled, serrate: stem simple, corymbed at the top: calyx cylindric, scurfy: rays 5, very short. About 12 inches high: flowers small.

Exotic.

chinen"sis, (china aster. ☉.) leaves ovate, thickly toothed, petioled: cauline ones sessile, at the base wedge-form; floral ones lanceolate, entire: stem hispid: branches 1-flowered: calyx foliaceous. A variety has very full flowers, various coloured, and very short rays. Cultivated.

3—2. AVENA. 4. 10.

Exotic.

sati'va, (oats J. ☉.) panicled: calyx 2-seeded: seeds smooth, one of them awned. First discovered in the island of Juan Fernandez. A variety is awnless, and has black seeds.

5—1. AZALEA. 18. 50.

nudiflo'ra, (early honeysuckle, pinxter blomaehee. O. r. M. ♄.) sub-naked-flowered: leaves lanceolate oblong, or oval, smooth or pubescent, uniform-coloured: nerves on the upper side downy, and beneath bristly; margin ciliate: flowers abundant, not viscous; their tubes longer than their divisions: teeth of the calyx short, oval, sub-rounded: stamens very much exsert. A variety, *coccinea*, has scarlet flowers and lanceolate leaves; another, *rutilans*, has deep-red flowers, and minute calyx; another, *carnea*, has pale-red flowers, with red bases and leafy calyx; another, *alba*, has white flowers, with a middling calyx; another, *papilionacea*, has red flowers, with the lower divisions white, calyx leafy; another, *partita*, has flesh-coloured flowers, 5-parted to the base; another, *polyandria*, has rose-coloured flowers, with from 10 to 20 staments. Woods. 2—6 f.

21—5. BÆOMYCES. 57. 2.

ros''eus, crust uniform, warty, white: peduncle (podetia) short, cylindric: receptacle sub-globose, pale-red. On the earth.

10—1. BAPTISIA. 32. 93.

tincto'ria, (wild indigo, O. y. Ju. ♃.) very glabrous and branching: leaves ternate, sub-sessile: leafets wedge-obovate, round-obtuse, (becoming black in drying:) stipules obsolete, oblong, acute, much shorter than the petioles: racemes terminal: legumes ovate, long-stiped. 2—3 f.

Southern.

alba, (O. w. J. ♃.) branches spreading: leaves ternate, petioled; leafets lanceolate, wedge-form at the base, obtuse, mucronate, glabrous: stipules subulate, shorter than the petioles: racemes terminal. 2 f.

13—2. BARTSIA. 40. 35.

pal''lida, (white painted cup. A. w-y. Au. ♃.) leaves alternate, linear, undivided; upper ones lanceolate; floral ones sub-oval, sub-toothed at the summit; all are 3-nerved: teeth of the calyx acute.

17—2. BELLIS. 49. 55.

Exotic.

peren''nis, (daisy, w. & p. Ap. ♃.) leaves obovate, crenate: scape naked, 1-flowered. Grows wild in cultivated fields in Pittsfield, Mass.

6—1. BERBERIS. 54. 78.

vulga'ris (barberry. y. M. ♄.) branches punctate: prickles mostly in threes: leaves obo'vate, remotely serrate: flowers racemed.

5—2. BETA. 12. 29.

Exotic.

vulga'ris (beet. g. Au. ♂.) flowers heaped together: lower leaves ovate.

19—12. BETULA. 50. 99.

populifo'lia, (white birch, poplar birch. Ju. ♄.) leaves deltoid, long-acuminate, unequally serrate, very glabrous: scales of the strobile with rounded lateral lobes: petioles glabrous. 30—40 f.

13—2. BIGNONIA. 40. 45.

radi'cans, (trumpet flower. O. r. & y. Ju. ♄.) leaves pinnate: leafets ovate, toothed, acuminate: corymb terminal: tube of the corolla thrice as long as the calyx: stem rooting. Most beautiful climbing shrub. One variety, *flammea*, has yellow-scarlet flowers; another variety, *coccinea*, has bright scarlet flowers. Cultivated. S.

1—2. BLITUM. 12. 29.

capita'tum, (strawberry blite. O. r. J. ☉.) heads in a terminal spike, not intermixed with leaves: leaves triangular, toothed. 15 i. *S.*

21—6. BOLETUS. 58. 1.

ignia'rius, dilated, smooth, cuticle in ridges: pileus hard, becoming dark at the base, at the margin cinnamon-colour, beneath yellowish-white. Grows on trunks. General form like a horse's hoof. It is called *touch-wood.*

5—1. BORAGO. 41. 42.

officina'lis, (borage. b. Ju. ☉.) leaves alternate; calyx spreading.

14—2. BRASSICA. 39. 63.

Exotic.

ra'pa, (turnip. ♂.) root caulescent, orbicular, depressed, fleshy: radical leaves rough; cauline ones very entire, smooth. Var. *ruta-baga*, has a turbinate, sub-fusiform root.

olera'cea, (common cabbage, including all the varieties caused by culture. ♂.) root caulescent, terete, fleshy: leaves smooth, glaucous, repand-lobate.

3—2. BRIZA. 4. 10.

me'dia, (quaking grass, rattle-snake grass? E. J. ♃.) panicle erect: spikelets heart-ovate, about 7-flowered; calyx smaller than the flowers. 1 f. Probably introduced.

13—2. BUCHNERA. 40. 34.

america'na, (blue-hearts. O. b. Au. ♃.) stem simple; leaves lanceolate, subdentate, rough, 3-nerved; flowers remote, spiked. In the herbarium this plant becomes black. 1 f. *S.*

11—1. CACTUS. 13. 85.

opun''tia (prickly pear. E. y. J. ♃.) proliferous; articulations compressed, ovate; bristles fascicular. The plant appears like a series of thick succulent leaves, one growing from the top of another. *S.*

17—4. CALENDULA. 49. 55.

Exotic.

officina'lis, (pot marygold. y. ⊙.) seed keeled, muricate, incurved.

19--12. CALLA. 2. 7.

palu'stris, (water arum. O. w. J. ♃.) leaves sub-roundish, heart-form, acute; spatha ovate, cuspidate, spreading when mature. Grows in wet places.

12—13. CALTHA. 26 61.

palu'stris, (O. y. Ap. ♃.) stem erect; leaves cordate, sub-orbicular, acute-crenate. 12—18 i.

5—1. CAMPANULA. 29. 52.

rotundifo'lia, (flax bell-flower, hair-bell. O. b. J. ♃.) glabrous; radical leaves heart-reniform, crenate; cauline ones linear, entire; panicle lax, few flowered; flowers nodding.

american'a, (E b. Au. ♃.) leaves ovate-lanceolate, long-acuminate; lower ones sub-cordate, with the petioles ciliate: flowers axillary, nearly sessile, in a terminal leafy raceme; corolla sub-rotate; style exsert. Cultivated. 2 f.

20—5. CANNABIS. 53. 98.

Exotic.

sati'va, (hemp. G. Au. ⊙.) stem pilose; leaves petioled, digitate; leafets lanceolate, serrate, pilose; staminate flowers solitary, axillary; pistillate ones spiked. 4—10 f.

5—1. CAPSICUM. 28. 41.

Exotic.

an''nuum, (guinea pepper, red pepper, cayenne pepper. y-g. w. Au. ⊙.) stem herbaceous: peduncles solitary. From South America. 10—18 i.

14—2. CARDAMINE. 39. 63.

pennsylva'nica, (American water-cress. O. w. M. ♃.) glabrous, branching; leaves pinnate: leafets roundish-oblong, obtuse, tooth-angled: silique narrow, erect. *S.*

17—1. CARDUUS. 49. 54.

pectina'tus, (E. p. ♂.) unarmed; leaves decurrent, lanceolate, pectinately pinnatifid: peduncles almost leafless, terminal, very long, about 1-flowered : flowers nodding, often discharging the pollen ; scales of the calyx linear spreading.

19—3. CAREX. 3. 9.

ster''ilis, (barren sedge. O. M. ♃.)spikelets in fives, sessile, approximate : fruit ovate, acuminate or somewhat beaked, 2-cleft, 3-sided-compressed, scabrous at the margin ; equalling the ovate acutish scale. 8 i. Wet. *S.*

retroflex''a, (O. M. ♃.) spikelets about in fours, alternate, ovate sub-approximate, sessile, bracted : fruit ovate, acutish, 2-toothed, margin glabrous or scabrous, reflex-spreading, about equal to the ovate acute scale. 1 f. Woods. *S.*

17—1. CARTHAMUS. 49. 54.

Exotic.

tincto'rius, (false saffron, safflower. y. J. ⊙.) leaves ovate, entire, serrate-aculeate.

5—2. CARUM. 45. 60.

Exotic.

ca'rui, (caraway. w. ♂.) stem branching ; leaves with ventricose sheaths ; partial involucrum none.

19—12. CARYA. 50. 94.

alba, (shag-walnut, shag-bark hickory. O. M. ♄.) leafets about 7, long-petioted, lance-oblong, acuminate, sharply serrate, villose beneath ; the terminal leafet sessile ; ament filiform, glabrous ; fruit globose, a little depressed ; nut compressed, oblique. *S.*

10—1. CASSIA. 33. 93.

mariland''ica, (wild senna. O. y. Au. ♃.) somewhat glabrous ; leaves in 8 pairs, lance-oblong, mucronate ; flowers in axillary racemes, and in terminal panicles ; legumes linear, curved. An excellent mild cathartic. B. River alluvion, 2—4 f.

chamæcrist''a, (cassia, patridge pea. E. y. Au. ⊙.) somewhat glabrous : leaves linear, in many pairs, the glands on the petioles sub-pedicelled : two of the petals spotted : legumes pubescent. A most elegant plant. 8—16 i. Dry sand, &c. *S.*

nic''titans, (E. y. Ju. ⊙.) spreading, pubescent ; leaves in many pairs, linear : glands of the petioles pedicelled : peduncles short, supra-axillary, 2 or 3 flowered ; flowers pentandrous. The leaves of this species, and of the chamæcrista, possess a considerable degree of irritability. 12 i.

Exotic.

senn''a, (Egyptian senna. ⊙.) leaves in 6 pairs ; petioles glandless : legume reniform.

19—12. CASTANEA. 50. 99.

america'na. (chesnut. O. g. J. ♄.) leaves lance-oblong, sinuate serrate, with the serratures mucronate, glabrous both sides. Large tree. *S.*

2—1. CATALPA. 40. 45.

cordifo'lia, (M. w. & y. ♄.) leaves simple, cordate, entire, by threes : flowers in panicles. 40—50 f. *S.*

5—1. CEANOTHUS. 43. 95.

america'nus, (New-Jersey tea. O. w. J. ♄.) leaves ovate, acuminate, serrate 3-nerved, pubescent beneath : panicles axillary, long-peduncled, sub-corymbed. *S.*

5—1. CELASTRUS. 43. 95.

scandens, (false bittersweet, staff-tree. O. y-w. J. ♄.) stem twining : leaves oblong, acuminate, serrate ; racemes terminal. Retains its scarlet berries through the winter.

21—5. CENOMYCE. 57. 2.

pyxada'ta, frond foliaceous; divisions crenulate, ascending: peduncles all turbinate, cup-form, glabrous, at length warty-granulate, scabrous, greenish-grey: cups regular; afterwards the margin is extended and proliferous; receptacles tawny.

coccife'ra, frond foliaceous, minute; divisions round, crenate, naked beneath; peduncles long-turbinate, naked, warty-scabrous, pale-yellowish, cinereous and green; all bearing cups, which are wine-glass-form; margin extended, fertile; receptacles rather large, at length roundish, scarlet.

17—3. CENTAUREA. 49. 54.

Exotic.

cya'nus, (blue bottle. b. w. r. J. ☉.) scales of the calyx serrate: leaves linear, entire; lower ones toothed. Naturalized.

4—1. CEPHALANTUS. 48. 56.

occidenta'lis, (button bush. O. w. Ju. ♄.) leaves opposite and in threes, oval, acuminate. Inflorescence a round head. Swamps. Var. *pubescens*, has the leaves and branchlets pubescent. 4—5 f. *S.*

10—5. CERASTIUM. 22. 82.

vulga'tum, (mouse-ear, chick weed. O. w. Ap. ☉.) hirsute, viscid, cespitose; leaves ovate: petals oblong, about equal to the calyx: flowers longer than the peduncle. 6—10 i. *S.*

10—1. CERCIS. 33. 93.

canaden''sis, (red-bud, judas tree. r. M. ♄.) leaves round-heart-form, acuminate, villose at the axils of the nerves: stipules minute: legumes short-stiped. Var. *pubescens*, has roundish acute leaves, pubescent beneath. 15—30 f.

21—5. CETRARIA. 57. 2.

islan''dica,, (the iceland lichen, iceland moss, C. Y.) frond olive-chesnut-brown, at the base reddish-white, white beneath; divisions erectish, sub-linear, many-cleft, channelled, tooth-ciliate: the fertile ones dilated: receptacles close-pressed, flat, one-coloured; margin frond-like, elevated, entire. On sandy plains, as on the barren plains near Beaver-ponds, in New-Haven, where it covers the earth very densely in many places.

6—3. CHAMAEROPS. 1. 11.

Southern.

serrula'ta, (E. Ju. ♄.) caudex creeping; stipes sharply serrate: fronds plated palmate. Fronds 2 f.

14—2. CHEIRANTHUS. 39. 63.

Exotic.

chei'ri, (wall-flower. J. ♃.) leaves lanceolate, acute, glabrous: branches angled; stem somewhat of a woody texture.

an''nuus, (stock july-flower. Ju. ☉.) leaves lanceolate, sub-dentate, obtuse, hoary; silique cylindric, with an acute apex.

12—1. CHELIDONIUM. 27. 62.

Exotic.

ma'jus, (celandine. y. M. ♃.) umbels axillary, peduncled: leaves alternate, pinnate, lobed. Naturalized.

13—2. CHELONE. 40. 45.

gla'bra, (snake-head, O. w. & r. Ju. ♃.) leaves opposite, lance-oblong, acuminate, serrate: spikes terminal, dense-flowered. Var. *alba*, leaves sub-sessile: flowers white. Var. *purpurea*, leaves short-petioled: flowers purple. Var. *lanceolata*, leaves lanceolate, acuminate, serrate, sessile, pubescent beneath: segments of the calyx oblong. Damp.

5—2. CHENOPODIUM. 12. 29.

album, (O. g. Ju. ☉.) leaves rhomboid-ovate, erose, entire behind, the upper ones oblong, entire, seed smooth. Var. *viride*, leaves lance-rhomboid, sinuate-toothed: racemes ramose, sub-foliaceous: stem very green. 2—4 f.

bo'trys, (oak-of-Jerusalem. O. g. J. ☉.) leaves oblong, sinuate: racemes naked, many-cleft. Sweet scented. 12 i. *S.*

10—1. CHIMAPHILA. 18. 51.

macula'ta, (spotted winter-green. O. w. Ju. ♃.) leaves lanceolate, rounded at the base, remotely serrate, marked with long spots: scape 2 or 3-flowered: filaments woolly.

umbella'ta, (prince's pine, bitter winter-green. O. r-w. Ju. ♃.) leaves serrate, uniformly green, wedge-lanceolate, with an acute base: scape corymbed: filaments glabrous.

2—1. CHIONANTHUS. 44. 37.

virgin″ica, (fringe tree. w. M. ♄.) panicle terminal, trifid: peduncles 3-flowered: leaves acute. Var. *montanus*, leaves oval lanceolate, coriaceous, glabrous; panicle dense; drupe oval. Var. *maritimus*, leaves obovate-lanceolate, membranaceous, pubescent; panicle very lax; drupe elliptic. Berries purplish-blue. *S.*

17—2. CHRYSANTHEMUM. 49. 55.

leucan″themum, (ox-eyed daisy. O. J. ♃.) leaves clasping, lanceolate, serrate, cut-toothed at the base; stem erect, branching. 12—20 i. *S.*

Exotic.

parthe'nium, (feverfew.) leaves petioled, compound, flat; leafets ovate, gashed; peduncles branching, corymbed; stem erect.

corona'rium, (garden crysanthemum. Au. ☉.) leaves bipinnatifid, acute, broader outwards; stem branching.

8—2. CHRYSOSPLENIUM. 13. 84.

oppositifo'lium, (golden saxifrage, water-carpet. O. y-r. M. ♃.) leaves opposite, roundish, slightly crenate, tapering for a little distance to the petiole. In rivulets, springs, &c.

17—1. CICHORIUM. 49. 53.

in″tybus, (succory or endive. O. b. Ju. ♃.) flowers axillary, in pairs, sessile; leaves runcinate.

Exotic.

endiv″ia, (garden endive. b. ♂.) peduncles axillary, in pairs; one long, 1-flowered, the other short, about 4-flowered; leaves oblong, denticulate. Var. *crispum*, has fringed leaves and solitary flowers.

5—2. CICUTA. 45. 60.

macula'ta, (O. w. Ju. ♃.) serratures of the leaves mucronate; petioles membranaceous, 2-lobed at the apex. Damp. 3—6 f.

Exotic.

viro'sa, (water hemlock. ♃.) umbels opposite to the leaves; petioles margined, obtuse; leafets ternate, acutely serrate. Root containing a yellow juice.

—1. CIRCAEA. 48. 88.

lutetia'na, (O. Aug. r—w. ♃.) stem erect; leaves ovate, remotely toothed, opaque, nearly smooth. 1—2 f. *S.*

12—1. CITRUS. 18. 70.

Exotic.

me'dica, (lemon tree. w. J. ♄.) leaves ovate, acuminate, with linear, wingless petiole. Var. *limon*, (lime tree) bears smaller fruit, which is almost round. 4—10 f.

auran''tium, (orange tree. w. ♄.) leaves oval, acuminate, with the petioles winged or margined.

5—1. CLAYTONIA. 13. 86.

virgin''ica, (O. w. r. A. ♃.) leaves linear-lanceolate; petals obovate, retuse; leaves of the calyx somewhat acute; root tuberous. Var. *latifolia*, leaves ovate-lanceolate; leaves of the calyx obtuse. 6—12 i.

12—13. CLEMATIS. 26. 61.

virgin''ica, (virgin's bower. O. w. Ju. ♄.) climbing; leaves ternate; leafets ovate, sub-cordate, gash-toothed and lobate; flowers panicled, dioecious. 15—20 f. *S.*

Exotic.

flam'mula, (sweet virgin's bower. ♄.) lower leaves laciniate; upper ones simple, entire, lanceolate.

6—1. CLEOME. 25. 64.

dodecan''dra, (O. r-w. Ju. ⊙.) viscid-pubescent; leaves ternate; leafets elliptical oblong; flowers generally dodecandrous. 1 f.

10—1. CLETHRA. 18. 51.

alnifo'lia (E. w. Au. ♄.) leaves wedge-obovate, acute, coarse-serrate, glabrous, both sides one colour; racemes spiked, simple, bracted, hoary-tomentose. 4—8 f.

17—1. CNICUS. 49. 54.

lanceola'tus, (common thistle. O. p. J. ♂.) leaves decurrent, hispid, pinnatifid; divisions 2-lobed, divaricate spinose; calyx ovate, with spider-web-like pubescence; scales lanceolate, spinose, spreading. 2—4 f. *S.*

arven''sis, (Canada thistle. O .p. J. ♃.) leaves sessile, pinnatifid, ciliate, spinose; stem panicled; calyx ovate, mucronate; scales broad-lanceolate, close-pressed; margin woolly. 2—3 f.

14—1. COCHLEARIA. 39. 63.

Exotic.

armora'cia, (horse-radish. w. J. ♃.) radical leaves lanceolate, crenate; cauline ones gashed. Naturalized.

19—3. COIX. 4. 10.

lach''ryma, (job's-tear. Ju. ⊙.) culm semi-terete above; flowers naked; fruit ovate.

2—1. COLLINSONIA. 42. 39.

canaden''sis, (O. y. Au. ♃.) leaves broad-cordate, ovate, glabrous: teeth of the calyx short, subulate: panicle terminal, compound. *S.*

16—10. COLUTEA. 32. 93.

vesica''ria, (senna herb. y. Ju.) leaves pinnate; leafets ovate: stem herbaceous, decumbent, villose: legumes orbicular, inflated.

3—1. COMMELINA. 6. 13.

angustifo'lia (day-flower. E. b. Ju. ♃.) assurgent, weak, somewhat glabrous: leaves lance-linear, very acute, flat, glabrous: sheathes subciliate: bracts (or involucra) peduncled, solitary, short-cordate. 12 i. *S.*

19—3. COMPTONIA. 50. 99.

asplenifo'lia, (sweet fern. O. g. Ap. ♄.) leaves long-linear, alternately crenate-pinnatifid. 18—48 i. *S.*

21—4. CONFERVA. 57. 2.

rufa, threads ramose, capillary, straight, obsoletely geniculate; branches and branchlets opposite, remotish; length of the joints equalling the diameter. In the sea. Reddish yellow, shining, in fascicles; threads of the thickness of human hair, 2 inches and longer, flaccid, soft.

5—2. CONIUM. 45. 60.

macula'tum, (poison hemlock. O. w. Ju. ♃.) stem very branching, spotted; leaves very compound; seed striate. Var. *crispatulum*, leaves crisped; ultimate divisions acuminate, or terminated in a bristle. 2—4 f.

6—1. CONVALLARIA. 11. 12.

1. *Corol deeply 4-parted, spreading: stamens 4: berry 2 celled. (Flowers in a terminal raceme.)*

bifo'lia, (6. w. M. J. ♃.) stem 2-leaved; leaves or short petioles cordate-oblong, very smooth on both sides; racemes simple, terminal; flowers tetrandrous. 4—6 i.

2. *Corolla 6-parted, spreading: filaments divergent, attached to the base of the segments. (Flowers in a terminal raceme.)*

stella'ta, (O. w. M. ♃.) stem with alternate, clasping, oval-lanceolate leaves; raceme simple, terminal. 8—18 i.

trifo'lia, (O. w. J. ♃.) stem about 3-leaved; leaves alternate, ovate-lanceolate, contracted at the base; raceme simple, terminal, few-flowered. 6—10 i.

racemo'sa, (spiked solomon see. O. y-w. M. ♃.) stem with alternate leaves; sessile, oblong-oval, acuminate, nerved, pubescent; flowers in a terminal raceme-panicle. 18—24 i.

Southern.

maja'lis, (lily of the valley. A. w. J. ♃.) scape naked, smooth; leaves oval-ovate.

5—1. CONVOLVULUS. 29. 43.

re'pens (field bind-weed. O. w. & r. J. ♃.) twining; leaves sagittate, with the apex acute and the lobes truncate, entire, (some obtuse;) bracts acute, longer than the calyx, and shorter than the middle of the corolla; peduncle angled, exceeding the petiole. *S.*

pandura'tus, (mechoacan. w. & r. Ju. ♃.) twining, pubescent: leaves broad-cordate, entire or lobed, guitar-form: peduncles long; flowers fascicled; calyx glabrous, awnless; corolla tubular-bell-form. Resembles rhubarb in its effects.

Exotic.

bata'tus, (sweet potato, carolina potato. w-r. Ju. ♃.) creeping, tuberous; leaves cordate, hastate, angular-lobed, 5-nerved, smoothish; peduncles long; flowers fascicled; corolla sub-campanulate. Cultivated.

purpu'reus, (common morning glory. b. p. J. ☉.) pubescent; leaves cordate, entire; peduncles 2 to 5-flowered; pedicels nodding, thickened; divisions of the calyx lanceolate; capsules glabrous. Cultivated.

12—13. COPTIS. 26. 61.

trifo'lia, (gold thread. O. w. M. ♃.) scape 1-flowered; leaves ternate. Roots long, filiform, golden-yellow. Tonic bitter. B. 2—4 i. *S.*

5—2. CORIANDRIUM.[*] 45. 60.

Exotic.

sati'vum, (coriander. w. J. ☉.) fruit globose; calyx and style permanent.

4—1. CORNUS. 45. 58.

canaden''sis, (dogweed, low cornel. O. w. M. ♃.) herbaceous; leaves at the top, whorled, veiny; involucra ovate, acuminate; fruit globose. 4—8 i. *S.*

flo'rida, (false box, dogwood tree. w-y. M. ♄.) leaves ovate, acuminate: involucra, 4, very large somewhat obcordate: fruit ovate. 15—30 f. *S.*

circina'ta, (O. w. J. ♄.) branches warty; leaves broad-oval, acuminate, white-downy beneath; cymes depressed. 6—8 f. *S.*

16—10. CORONILLA. 32. 93.

em''erus, (coronilla. y. ♃.) stem angled, woody; peduncles about 3-flowered; claws of the petals about thrice as long as the calyx.

16—5. CORYDALIS. 24. 62.

cuculla'ria, (colic weed. O. y. & w. M. ♃) corolla 2-spurred; scape naked; raceme simple, 1-sided; nectaries divaricate, of the length of the corolla; style enclosed. 8—12 i. *S.*

19—12. CORYLUS. 50. 99.

america'na, (hazle nut. O. Ap. ♄.) leaves roundish, cordate, acuminate; calyx roundish-campanulate, larger than the sub-globose nut; border dilated, coarsely serrate. 3—5 f. *S.*

11—5. CRATAEGUS. 36. 92.

cocci'nea, (thorn-bush. O. w. M. ♄.) thorny; leaves long-petioled, ovate, acutely-lobed, serrate, glabrous; petioles and pubescent calyx glandular; flowers pentagynous. Var. *viridis*, has lance-ovate leaves, subtrilobate; stem unarmed.

puncta'ta, (common thorn-tree. O. w. M. ♄.) thorny or unarmed; leaves wedge-obovate, sub-plicate, glabrous, serrate; calyx villose; divisions subulate, entire. *S.*

Exotic.

oxycan''tha, (quickset. w. M. ♄.) leaves obtuse, somewhat 3-cleft, serrate, glabrous; peduncles and calyx somewhat glabrous; segments of the calyx lanceolate, acute; styles 2. Naturalized.

3—1. CROCUS. 6. 18.

officina'lis, (saffron. y. ♃.) leaves linear, with revolute margins; stigma exsert, with long-linear segments. Var. *sativus*, having violet corollas.

sagitta'lis, (rattle-box. E. y. Ju. ☉.) hirsute, erect, branching; leaves simple, lance-oblong; stipules lanceolate, acuminate, decurrent; racemes opposite to the leaves, about 3-flowered; corolla less than the calyx. *S.*

16—10. CROTALLARIA. 32. 93.

sagitta'lis, (rattle-box. y. Ju. ☉.) hairy, erect, branching; leaves simple, ovate-lanceolate: stipules lanceolate, acuminate, decurrent; racemes opposite the leaves about 3-flowered: corolla smaller than the calyx. 12 i. *S.*

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[*] Coriandrum *americanum*, described under class Pentandria. See page 320.

19—16. CUCUMIS. 34. 97.

Exotic.

angu'ria, (prickly cucumber.) leaves palmate-sinuate; fruit globose, echinate.

me'lo, (muskmelon. y. Ju. ☉.) angles of the leaves rounded; pome oblong, torulose. Sweet scented.

sati'vus, (cucumber. y. Ju. ☉.) angles of the leaves straight; pomaceous berry oblong, scabrous. Brought from Asia.

19—16. CUCURBITA. 34. 97.

Exotic.

ovif''era, (egg-squash. ☉.) leaves cordate, angled, 5-lobed, denticulate, pubescent; pomaceous berry with fillet-like stripes lengthwise.

pep''o, (pumpkin. y. Ju. ☉.) leaves cordate, obtuse, sub-5-lobed, denticulate: pomaceous berry roundish or oblong, smooth. Var. *potiro*, has the fruit more or less flattened. From Asia.

citrul''lus, watermelon. y. Au. ☉.) leaves 5-lobed; the lobes sinuate-pinnatifid, obtuse: pomaceous berry oval, smooth. Fruit watery, often striped. From Africa and the south of Asia.

lagena'ria, (gourd, calabash. w. Au. ☉.) leaves cordate, round-obtuse, pubescent, denticulate, with 2 glands at the base on the under side: pomaceous berry clavate, somewhat woody.

11—1. CUPHEA. 54. 91.

viscosis''sima, (wax-bush. E. p. J. ♄.) viscous; leaves opposite, petioled, ovate-oblong; flowers with 12 stamens, lateral, solitary; peduncles very short. *S.*

19—15. CUPRESSUS. 51. 100.

thyoi'des, (white cedar. O. M. ♄.) branchlets compressed; leaves imbricate four ways, ovate, tubercled at the base; strobile globular. *S.*

5—2. CUSCUTA. 29. 43.

america'na, (dodder. O. w. Au. ☉.) flowers peduncled, umbelled, 5-cleft; stigma capitate. A bright yellow leafless vine, twining round other weeds in damp places.

europe'a, (E. w. Au. ☉.) flowers sub-sessile; stigma acute; stamens 4 or 5.

pulchel''lum, (grass pink. O. r. Ju. ♃.) radical leaves ensiform, nerved; scape few flowered; lip erect, slender at the base; lamina spread; disk concave, bearded. Var. *graminifolia*, leaves 1—2 lines broad; bracted ones acuminate. 12—18 i. *S.*

17—1. CYNARA. 49. 54.

Exotic.

scol''ymus, (garden artichoke. ♃.) leaves sub-spinose, pinnate; scales of the calyx ovate. Naturalized.

5—1. CYNOGLOSSUM. 41. 42.

officina'le, (hound-tongue. O. p. Ju. ♂.) very soft-pubescent; leaves broad-lanceolate, sessile; panicled racemes.

18—2. CYPRIPEDIUM. 7. 21.

pubes''cens, (yellow ladies' slipper. y. M. ♃.) stem leafy; lobe of the style triangular-oblong, obtuse; outer petals oblong-ovate, acuminate; inner ones very long, linear, contorted; lip compressed, shorter than the petals. *S.*

specta'bile, (gay ladies' slipper. O. w. & p. J. ♃.) stem leafy: lobe of the style oval-cordate, obtuse: outer petals broad-oval, obtuse: lip longer than the petals, split before. *S.*

acau'le, (low-ladies' slipper. O. w. & p. M. ♃.) scape leafless, 1-flowered: radical leaves 2, oblong, obtuse: lobe of the style roundish-rhomboidal, acuminate, deflexed: petals lanceolate; lip shorter than the petals, cleft before. 1 f. *S.*

3—2. DACTYLIS. 4. 10.

glomera'ta, (E. J. ♃.) panicle glomerate: leaves carinate. 2—3 f. *S.*

11—13. DALIBARDA. 35. 92.

fragaro'ides, (dry straw-berry. E. y. M. ♃.) leaves ternate; leafets wedge-form, gash-serrate, ciliate: peduncles many-flowered: tube of the calyx obconic. 5—8 i.

8—1. DAPHNE. 31. 25.

Exotic.

meze'reum, (mezereon. M. ♄.) flowers sessile, cauline, in threes: leaves lanceolate.

5—1. DATURA. 28. 41.

stramo'nium, (thorn apple. O. w-b. Au. ☉.) pericarps spinose, erect, ovate: leaves ovate, glabrous, angular-dentate. *S.*

5—2. DAUCUS. 45. 60.

caro'ta, (carrot. w. J. ♂.) seeds hispid: petioles nerved underside; divisions of the leafets narrow-linear, acute. 2—3 f.

12—2. DELPHINIUM. 26. 61.

Exotic.

consol"idum, (larkspur. b. Ju. ☉.) nectaries 1-leaved; stem sub-divided. Naturalized.

14—2. DENTARIA. 39. 63.

diphyl"la, (tooth-root. O. y. M. ♃.) stem 2-leaved; leafets ternate, sub-ovate, unequally and incisely dentate: root toothed. 6—8 i. *S.*

10—2. DIANTHUS. 22. 82.

arme'ria, (pink. r. Ju. ☉.) flowers aggregate, fascicled; scales of the calyx lanceolate, villose, equalling the tube. 1 f.

Exotic.

barba'tus, (sweet-william. r. & w. Ju. ♃.) flowers fascicled; scales of the calyx ovate-subulate, equalling the tube; leaves lanceolate.

caryophyl"lus, (carnation or pink. r. & w. ♃.) flowers solitary; scales of the calyx sub-rhomboid, very short; petals crenate, beardless; leaves linear-subulate, channelled. By rich culture, the stamens mostly change to petals.

chinen"sis, (china pink. Ju. ☉) flowers solitary; scales of the calyx subulate, spreading, leafy, equalling the tube; petals crenate: leaves lanceolate.

pluma'rius, (single pink. r. & w. ♃.) flowers solitary; scales of the calyx sub-ovate, very short and obtuse, awnless: corolla many-cleft, with the throat hairy.

5—1. DIERVILLA. 48. 58.

canaden"sis, (bush honey-suckle. O. y. Ju. ♄.) peduncles axillary and terminal, dichotomous, 3-flowered: leaves ovate, serrate, acuminate. 2—3 f. *S.*

13—2. DIGITALIS. 40. 40.

Exotic.

purpu'rea, (foxglove. p. Ju. ♂.) leafets of the calyx ovate, acute: corolla obtuse: upper lip entire: leaves lance-ovate, rugose.

10—1. DIONÆA. 20. 68.

Southern.

muscip"ula, (Venus' fly-trap. E. w. Ju. ♃.)radical leaves, with terminal ciliate appendages, somewhat resembling a rat-trap; this is suddenly closed on being irritated.

4—1. DIPSACUS. 18. 56.

sylves"tris, (wild teasel. O. w-b. Ju. ♂.) leaves rarely connate, opposite: scales of the receptacle straight: involucrum curved upward. 3—4 f. *S.*

5—1. ECHIUM. 41. 42.

vulga're, (blue thistle. b. M. ♂.) stem tuberculate-hispid: leaves lance-linear, hispid: spikes lateral: stamens longer than the corolla. 2—3 f. *S.*

5—1. DROSERA. 20. 68.

rotundifo'lia, (sundew. O. y-w. Au. ♃.) scape simple: leaves nearly orbicular, narrowed at the base: petioles long, downy. Wet or damp. 4—8 i. *S.*

17—5. ELEPHANTOPUS. 49. 55.

carolinia'nus, (elephant-foot. r. Au. ♃.) radical and cauline leaves oblong, narrowed at the base, pilose on both sides: stem erect, pilose, leafy. 2 f. *S.*

10—1. EPIGÆA. 18. 51.

re'pens, (trailing arbutus. O. r. & w. Ap. ♄.) stem creeping: branches and petioles very hirsute: leaves cordate-ovate, entire: corolla cylindric.

8—1. EPILOBIUM. 17. 88.

spica'tum, (willow herb. O. p. Ju. ♃.) leaves scattered, lance-linear, veiny, glabrous: flowers unequal: stamens declined. 4—6 f.

13—2. EPIPHEGUS. 40. 35.

virginia'nus, (beech drops, cancer root. O. y. p. Ju. ♃.) stem very branching: flowers alternate, distant: calyx short, cup-form, shorter than the capsule. The whole plant is yellowish-white and of a naked appearance. 8—12 i. *S.* Astringent.

21—1. EQUISETUM. 55. 5.

hyema'le, (scouring rush. E. Ju. ♃.) stems erect, very scabrous, bearing spikes at the apex: sheaths 2-coloured, withering at the base and apex: teeth with caducous awns. 2—3 f. S.

8—1. ERICA. 18. 51.

Exotic.

pubes"cens, (downy heath. r. M.) corolla linear, pubescent, with the limb erect; capsule glabrous: leaves fringed.

17—2. ERIGERON. 49. 55.

bellidifo'lium, (O. w-p. M. ♃.) hairy, gray: radical leaves obovate, subserrate; stem leaves remote, oblong-ovate, amplexicaul, entire: stem 3-5-flowered: rays nearly twice as long as the hemispherical calyx. 12—18 i. *S.*

philadel"phicum, (O. w-p. J. ♃.) pubescent: leaves wedge-oblong, subserrate; cauline ones half-clasping: ray florets capillary, as long as the disk: stem branched above, many-flowered. 2—3 f. *S.*

15—5. ERODIUM. 14. 73.

Exotic.

cico'nium, (stork-bill geranium. ⊙.) peduncle many-flowered: leaves pinnate: leafets pinnatifid, toothed: petals oblong, obtuse; stem ascending.

cicuta'rium, (hemlock geranium. p. Ap. ⊙.) peduncles many-flowered: leaves pinnate; leafets sessile, pinnatifid, gashed: corolla larger than the calyx: stem prostrate, hirsute.

moscha'tum, (musk geranium. ⊙.) peduncles many-flowered: leaves pinnate;

leafets sub-petioled, oblong, gash-toothed : petals equalling the calyx : stem procumbent.

14—2. ERYSIMUM. 39. 63.

amphib"ium, (water radish. O. y. J. ♃.) silique (or rather silicle) oblong-ovate, declined : leaves lance-oblong, pinnatifid or serrate : petals longer than the calyx. Wet. 1—2 f. *S.*

palus"tre, (y. Ju. ☉) leaves lyrate-pinnatifid : lobes confluent, unequally dentate, smooth : petals as long as the calyx : siliques short, turgid : root spindle-form. 18 i. *S.*

6—1. ERYTHRONIUM. 11. 14.

america'num,* (dog-tooth violet, adder's tongue. O. y. Ap. ♃.) leaves lance-oval, punctate : petals oblong-lanceolate, obtuse at the point : inner ones 2-dentate near the base : style clavate ; stigma entire. (stigmas 3.) 6—8 i.

13—2. EUCHROMA. 40. 40.

cocci'nea, (painted cup. O. y. & r. J. ♂.) leaves alternate, linear, gash-pinnatifid ; divisions linear ; bracts dilated, generally 3-cleft, longer than the flowers ; calyx 2-cleft, about equal to the corolla : divisions retuse, emarginate. Flowers yellow, with scarlet bracts. One variety, *pallens*, has yellow bracts. 10—16 i. S.

17—1. EUPATORIUM. 49. 55.

Calyxes more than 5-flowered.

purpu'reum, (purple thorough-wort, joe-pye. O. p. Au. ♃.) leaves in fours or fives, petioled, lance-ovate, serrate, rugose-veined, roughish ; stem hollow. 4—6 f. *S.*

perfolia'tum, (boneset, thorough-wort. O. w. Au. ♃.) leaves connate-perfoilate, oblong-serrate, rugose, downy beneath ; stem villose. 2 f. *S.*

13—2. EUPHRASIA. 40. 35.

officina'lis, (eyebright. w. Ju. ☉.) leaves ovate, obtusely toothed ; lower divisions of the lip emarginate.

19—12. FAGUS. 50. 99.

ferrugin"ea, (red beech: O. y-w. M. ♄.) leaves ovate-oblong, acuminate, pubescent beneath, coarsely toothed, at the base obtuse, sub-cordate-oblique ; nuts ovate, acutely 3-sided.

23—3. FICUS. 53. 98.

Exotic.

ca'rica, (fig-tree. g. Ju. ♄.) leaves cordate, 3 or 5-lobed, repand-toothed ; lobes obtuse, scabrous above, pubescent beneath. 5—8 f.

11—13. FRAGARIA. 35. 92.

virginia'na, (wild-strawberry. O. w. M. ♃.) calyx of the fruit spreading : hairs on the petioles erect, on the peduncles close pressed ; leaves somewhat glabrous above.

Exotic.

vesca, (English strawberry. w. M. ♃.) calyx of the fruit reflexed ; hairs on the petioles spreading, on the peduncles close-pressed.

20—2. FRAXINUS. 44. 37.

acumina'ta, (white ash. O. w-g. M. ♄.) leafets petioled, oblong, shining, acuminate, very entire, or slightly toothed, glaucous beneath ; flowers calycled. *S.*

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* Called by some writers *dens canis.*

6—1. FRITILLARIA. 10. 14.

Exotic.

imperia'lis, (crown imperial. r. & y. M. ♃.) flowers under a leafy crown, nodding ; leaves lance-linear, entire. From Persia.

malea'gris, (fritillary, guinea-hen-flower. p. & y. M. ♃.) leaves alternate, linear, channelled ; stem 1-flowered ; nectary linear. Flower checkered.

3—1. FUCHSIA. 17. 88.

Exotic.

mogella'nica, (car-drop. r.) peduncles axillary, 1-flowered ; leaves opposite or in threes, very entire. Flowers pendulous.

21—4. FUCUS. 57. 2.

lorens, stem very short, dilated into a cup, sending out a fusiform, dichotomous receptacle. In the ocean.

16—6. FUMARIA. 24. 62.

Exotic.

officina'lis, (fumitory. r. J. ☉.) stem branching, spread ; leaves more than decompound ; leafets wedge-lanceolate, gashed. Naturalized. 6—10 i.

21—2. FUNARIA. 56. 4.

hygromet''rica, (hygrometer moss.) leaves ovate, acute, concave, entire, inflected ; capsules swelling, drooping, pear-form , pedicles very long, twisting spirally when dry.

6—1. GALANTHUS. 6. 17.

niva'lis, (snow-drop. w. Ap. ♃.) leaves linear, keeled, acute, radical ; scape 1-flowered.

4—1. GALIUM. 47. 57.

Fruit glabrous.

trif'idum, (bed-straw. E. w. Ju. ♃.) stem procumbent, scabrous backwards ; cauline leaves in fives ; branch leaves in fours, linear, obtuse, scabrous at the margin and on the nerves ; fascicle terminal, few-flowered ; pedicels short ; corollas mostly 3-cleft. *S.*

asprel''lum, (rough bed-straw. O. w. Ju. ♃.) stem diffuse, very branching, prickly backwards ; leaves in fives and sixes, lanceolate, acuminate ; margins and nerves prickly : pedicles short. 18—24 i. *S.*

10—1. GAULTHERIA. 18. 51.

procum''bens, (spicy wintergreen. O. w. J. ♃. or ♄.) stem procumbent ; branches erect : leaves obovate, acute at the base : flowers few, nodding. Berries red, consisting in part of the permanent calyx : a little mealy, pleasant tasted. *S.*

5—2. GENTIANA. 47. 46.

crini'ta, (fringed gentian. O. b. S. ♃.) stem terete : branches long, 1-flowered ; leaves lanceolate, acute : corolla 4-cleft : divisions obovate, gash-ciliate. 18 i. *S.*

sapona'ria, (O. b. Oct. ♃.) leaves ovate ; lanceolate, acute, 3-nerved ; flowers whirl-capitate, sessile ; corol ventricose, closed, 10-cleft ; interior segments unequally 3-cleft, as long as the exterior ones : segments of the calyx ovate, shorter than the tube. 18 i. *S.*

15—10. GERANIUM.* 14. 73.

macula'tum, (crow-foot geranium, O. r. & b. J. ♃.) erect : pubescence reversed : stem dichotomous : leaves opposite, 3 or 5-parted, gashed : upper ones sessile : peduncles 2-flowered : petals obovate. 1—2 f. *S.*

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* See Erodium and Pelargonium.

Exotic.

sanguin''eum, (bloody geranium. ♃.) peduncle 1-flowered : leaves 5-parted 3-cleft, orbicular : capsule bristly at the top.

13—2. GERARDIA. 40. 40.

1. *Flowers purple.*

tenuifo'lia, (O. Au. —Sept. ♂.) very branching : leaves linear, acute, scabrous : peduncles axillary, longer than the flowers : teeth of the calyx acute. 6—10 i. *S.*

2. *Flowers yellow.*

flava, (false foxglove. O. y. Ju. ♃.) pubescent : stem nearly simple : leaves sub-sessile, lanceolate, entire or toothed : lower ones sub-pinnatifid, gashed : flowered axillary, opposite, sub-sessile. 2—3 f. *S.*

11—13. GEUM. 35. 92.

riva'le, (purple veins, O. p. J. ♃.)pubescent : stem simple : radical leaves interruptedly pinnate ; cauline ones 3—cleft ; flowers nodding : petals as long as the calyx ; awns plumose, nearly naked at the top, minutely uncinate. 18 in.

virginia'num, (avens. O. w, Ju. ♃.) pubescent : radicle and lower cauline leaves ternate, upper ones lanceolate : stipules ovate, sub-entire : flowers erect : petals shorter than the calyx : awns hooked, naked ; at the apex twisted, hairy. Var. *trilobum*, has the radical leaves 3-lobed or ternate. 2 f. *S.*

13—1. GLECHOMA. 42. 39.

hedera'cea, (ground-ivy, gill-overground. O. b. & r. M. ♃.) leaves reniform crenate : stem rooting. Var. *cordata*, leaves cordate. *S.*

17—2. GNAPHALIUM. 49. 55.

margarita'ceum, (large-flowered life-everlasting. O. y. & w. Ju. ♃.) leaves linear-lanceolate, gradually narrowing, acute : stem branching above ; corymb fastigiate ; flowers pedicelled. Flowers with white pearly rays and yellow disks. 1—2 f. *S.*

polyceph''alum, (sweet-scented life-everlasting. O. y-w. Ju. ⊙.) leaves lance-linear, acute, glabrous above, downy beneath : stem panicled, downy : corymbs terminal. 1—2 f. *S.*

5—1. GOMPHRENA. 54. 30.

Exotic.

globo'sa, (globe amaranth, bachelor's button. r. Au. ⊙.) stem erect : leaves lance-ovate : heads solitary : peduncles 2-leaved.

18—1. GOODYERA. 7. 21.

pubes''cens (rattle-snake leaf, scrophula-weed. O. y. w. Ju. ♃.) leaves radical, ovate, petioled, veins coloured, reticulate ; scape sheathed ; scape and flower pubescent : lip ovate-acuminate : petals ovate. 10—15 i. *S.*

15—13. GOSSYPIUM. 37. 74.

Exotic.

herba'ceum, (cotton. Au. ♂.) leaves 5-lobed, mucronate, one gland beneath ; stem herbaceous, smooth. 5 f.

2—1. GRATIOLA. 40. 40.

virgin''ica, (creeping hedge hyssop. O. w. and y. ♃.) stem pubescent, assurgent, terete ; leaves smooth, lanceolate, sparingly dentate, serrate, alternate, and connate at the base ; leaves of the calyx equal ; sterile filaments none. 6—8 in. *S.*

21—5. GYROPHORA. 57. 2.

pensylva'nica, frond tawny olive ; under side rough-granulate ; receptacles marginated. On rocks and mountains.

18—1. HABENARIA. 7. 21.

phyco'des, (O. g-w. Ju. ♃.) lip 3-parted; segments finely divided; petals obtuse; horn filiform-clavate, ascending, longer than the germ.

viridoflo'rum. (g. and p. Au. ♃.) stem erect, branched, scabrous; leaves ternate, ovate, obtuse, scabrous above, villous and very soft beneath; panicle terminal, very long, naked: joints of the lowest triangular. 3 f. *S.*

rotundifo'lium, (O. p. Au. ♃.) stem prostrate, hairy; leaves ternate, suborbicular, hairy; stipules cordate, reflexed; racemes axillary, paniculate; joints of the loment sub-rhomboidal. 2—3 f. *S.*

acumina'tum, (O. p. Ju. ♃.) erect, simple, pubescent: leaves ternate, ovate, conspicuously acuminate, a little hairy; panicle terminal, on a very long naked peduncle; joints of the loment roundish. 1—2 f. S.

21—4. HALUMENIA. 57. 2.

palma'ta, frond flat, sub-palmate; divisions oblong, sub-simple; colour reddish-purple; substance at first thin and membranaceous, at length passing into a soft leathery substance. In the sea.

4—2. HAMAMELIS. 54. 78.

virgin''ica, (witch hazle. O. y. Oc. ♄.) leaves, obovate acute, toothed, cordate, with a small sinus. Var. *parvifolia*, leaves oblong-ovate, upper part undulate-coarse-crenate, pubescent and somewhat hirsute beneath; divisions of the calyx oblong; flowers in the fall, and perfects the fruit the next summer. 5—15 f. S.

13—1. HEDEOMA. 42. 39.

pulegio'ides, (penny-royal. O. b. J. ⊙.) pubescent; leaves oblong, serrate; peduncles axillary, whorled. 6—8 i. *S.*

5—1. HEDERA. 46. 58.

helix, (english ivy. g-w. S. ♄.) leaves 3 or 5-lobed; floral ones ovate; umbel erect.

16—10. HEDYSARUM. 32. 93.

canaden''se, (bush trefoil. O. r. Ju. ♃.) erect, smoothish; leaves ternate, lance-oblong; stipules filiform; flowers racemed; bracts lance-ovate, acuminate, ciliate; joints of the loment obtusely triangled, hispid. 3 f. S.

17—2. HELENIUM. 49. 55.

autumna'le, (false sunflower. O. y. Au. ♃.) leaves lanceolate, serrate, subdecurrent: stem corymbed above: disk florets 5-cleft: rays flat, reflexed. Var. *pubescens*, leaves pubescent. 3—5 f. S.

17—3. HELIANTHUS. 49. 55.

1. *Leaves opposite.*

trachelifo'lius, (y. Au. ♃.) leaves ovate-lanceolate, acuminate, serrate, triply-nerved, very scabrous on both sides; scales of the calyx lance-linear, ciliate; outer ones longest. 3—4 f. *S.*

2. Upper leaves alternate.

Exotic.

tubero'sus, (jerusalem artichoke, y. S. ♃.) leaves 3-nerved, scabrous; lower ones heart-ovate, upper ones ovate, acuminate: petioles ciliate. Root tuberous. Naturalized. 4—8 i.

an''nuus, (common sunflower. y. & w, Ju. ♃.) leaves all cordate, 3-nerved; peduncles thickening upwards; flowers nodding. 6—10 f.

17—2. HELIOPSIS. 49. 55.

lævis, (ox-eye. O. Ju. ♃.) stem glabrous; leaves opposite, ovate, serrate, 3-nerved, smooth. 3—5 f. *S.*

5—1. HELIOTROPIUM, 41. 42.

Southern.

in''dicum, (turnsole. E. b. Ju. ⊙.) leaves heart-ovate, acute, roughish; spikes solitary; fruit bifid. 8—12 i.

12—13. HELLEBORUS. 26. 61.

foe'tidus, (hellebore.) stem many-flowered, leafy; leaves pedate, remotely serrate, coriaceous; corolla somewhat converging.

6—1. HEMEROCALLIS. 10. 16.

Exotic.

flava, (yellow day-lily. y. Ju. ♃.) leaves broad-linear, keeled; petals flat, acute; nerves of the petals undivided.

12—13. HEPATICA. 26. 61.

acutil''oba, (heart-liverleaf. O. w. & b. Ap. ♃.) leaves cordate, 3 to 5-lobed: lobes entire, acute; leaves of the calyx acute. Grows in woods, preferring the north side of hills and mountains. This is the Var. *acuta* of the *triloba*, of Wildenow. 5 i.

america'na, (kidney-liverleaf. O. w. & b. Ap. ♃.) leaves heart-reniform, 3-lobed; lobes entire, round-obtuse: leaves of the calyx obtuse. Grows chiefly in woods, preferring the south side of hills and mountains. This has been mistaken for the *triloba* of W. 5 i.

16—13. HIBISCUS. 37. 74.

Exotic.

phœni'cius, (phenicean mallows. r. Ju. ♃.) leaves ovate, acuminate, serrate and crenate, lower ones 3-cuspidate: peduncles jointed: seeds woolly. 6—8 f.

syr'iacus, (syrian mallows. w. & p. Au. ♄.) leaves wedge-ovate, 3-lobed, toothed: outer calyx about 8-leaved, of the length of the inner. 5—10 f.

esculen''tus, (okra. y. Ju. ☉.) leaves heart-5-lobed, obtusish, toothed: petiole longer than the flower: outer calyx about 5-leaved, caducous, bursting lengthwise. 3 f.

17—1. HIERACIUM. 49. 53.

veno''sum, (vein-leaf hawkweed. O. y. Ju. ♃.) scape naked, corymb-panicled glabrous: leaves lance-obovate with thin hairs above and naked beneath, margin ciliate, glandular-toothed, veins coloured: calyx glabrous. 1—2 f. *S.*

auranti'acum, (orange hawkweed. y. ♃.) scape leafy, hispid: flowers corymbed: peduncles glomerate: leaves oblong, acutish, pilose-hispid.

kal''mii, O. y. Au. ♃.) stem erect, sub-villose: leaves sessile, lanceolate, acuminate. sharply and divaricately toothed: panicle sub-corymbose: pedicels downy. 2 f.

1—1. HIPPURIS. 15. 88.

vulga'ris, (mares tail. y-g. M. ♃.) leaves linear, and lance-linear, verticillate. *S.*

3—2. HORDEUM. 4. 10.

juba'tum, (O. J. ♂.) lateral florets abortive, neuter: awns of the calyx and corolla 6 times as long as the flowers. 2 f. *S.*

Exotic.

vulga're, (barley. Ju. ☉.) florets all perfect, awned, in two erect rows.

10—3. HORTENSIA. 13. 84.

Exotic.

specio'sa, (changeable hydrangea. r. & w. J. ♄.) leaves broadly ovate, serrate, acuminate; flowers corymbed. From the East Indies. This is the common flower-pot shrub, usually called hyderindia.

4—1. HOUSTONIA. 47. 57.

cæru'lea, (venus pride, forget-me-not. O. b, & w. M. ♃.) stem erect, setaceous, dichotomous: radical leaves spatulate; cauline ones oblanceolate, opposite: peduncles 1-flowered, elongated. 4—6 i. *S.*

20—5. HUMULUS. 53. 98.

lu'pulus, (hop. O. g-y. Au. ♃.) stem twining with the sun: leaves lobed. One of the best of tonics.

6—1. HYACINTHUS. 10. 16.

Exotic.

orienta'lis, (garden hyacinth. r. Ap, ♃.) corolla funnel-form, half-6-cleft, ventricose at the base.

mus''cari, (musk hyacinth. b. Ap. ♃.) corollas ovate, all equal.

botryo'ides, (grape hyacinth. b. Ap. ♃.) corollas globose, uniform: leaves cylindric, channelled, straight.

10—2. HYDRANGEA. 13. 84.

vulga'ris, (hydrangea, E. w. Au. ♄.) leaves oblong-ovate, obtuse at the base, acuminate, glabrous beneath: cymes naked. 5 f. *S.*

Hydrangea. See HORTENSIA.

12—13. HYDRASTIS. 26. 61.

canaden''sis, (orange root. O. w-r. Ap. ♃.) stem with two opposite leaves above: leaves petioled, emarginate at the base, palmate, serrate, gashed: peduncle terminal, solitary, 1-flowered. Roots yellow. *S.*

12—5. HYPERICUM. 20. 68.

perfora'tum, (O. y. J. ♃.) erect, branching: stem 2-edged; leaves oblong, obtuse, transparently punctate; panicle terminal, brachiate, leafy: petals twice as long as the acute, lanceolate calyx. This is the common St. John's wort, so troublesome to farmers. 1—3 f. *S.*

virgin''icum, (O. p. Au. ♃.) flowers with 9 or 12 stamens, distinctly arranged in three parcels, and separated by nectaries: leaves oval, obtuse, clasping: stem compressed. 1—2 f. *S.*

6—1. HYPOXIS. 10. 17.

erec''ta. (star-grass. O. y. Ju. ♃.) pilose: scape 2 or 3-flowered: leaves lance-linear: divisions of the corolla lance-oblong. Var. *graminea*, has longer and narrower leaves; more flowers, longer lance-linear divisions to the corolla—and altogether a more grassy appearance.

4—1. ICTODES. 2. 7.

fœ'tida, (skunk cabbage, fetid hellebore. O. p. Ap. ♃.) stemless leaves radical, heart-ovate, very large spadix supporting the flowers in a subglobose head. Odour resembles that of the skunk. *S.*

4—4. ILEX. 43. 95.

opa'ca, (evergreen holly. E. g-w. M. ♄.) leaves evergreen, ovate, acute, spinose glabrous, flat: flowers scattered at the base of the shoots of the preceding year. A middle sized tree. *S.*

5—1. IMPATIENS. 24. 73.

pal''lida, (jewel-weed, touch-me-not. O. y. Ju. ☉.) peduncles solitary, 2 & 4-flowered: nectary obtusely conic, dilated, shorter than the petals: spur recurved, very short; flowers sparingly punctate; leaves rhomb-ovate, mucronate-toothed. 2—4 f. *S.*

16—10. INDIGOFERA. 32. 93.

Exotic.

tincto'ria, (indigo. ♄.) leaves pinnate, oblong, glabrous, in four pairs; racemes shorter than the leaves; legume terete, somewhat arched. From the East Indies.

17—2. INULA. 49. 55.

Exotic.

hele'nium, (elecampane. y. Au. ♃.) leaves clasping, ovate, rugose, tomentose beneath: scales of the calyx ovate. Naturalized. 3—5 f.

5—1. IPOMEA. 29. 43.

nil, (morning glory. E. b. Ju. ☉.) hirsute: leaves cordate, 3-lobed: peduncles short, 1—3-flowered: calyx very villose, long acuminate. *S.*

bonanox, (E. w. Ju. ☉.) very glabrous: leaves cordate, entire or angled: peduncle 1 to 3-flowered: calyx awned: corolla undivided, tube long.

3—1. IRIS. 6. 18.

versic''olor, (O. b. J. ♃.) leaves ensiform: stem acute on one side: capsules oblong, 3-sided with obtuse angles. 2—3 f. *S.*

prismat''ica. (boston iris. E. b. y. J. ♃.) flowers beardless: leaves linear; stem round, many-flowered; germs triangular, twice grooved on the sides. 1—2 f.

Exotic.

plica'ta, (garden iris. p. w. M. ♃.) bearded; stem many flowered, higher than the leaves; petals undulate-plicate, erect ones broadest. 18.–24 i.

pu'mila, (dwarf-flower-de-luce. b. M. ♃.) bearded; scape 1-flowered: leaves ensiform, glabrous; tube of the corolla exsert; petals oblong, obtuse. 6—10 i.

ochrole'uca, (yellow iris. y. M.) beardless; leaves ensiform, depressed, striate; scape sub-terete; germ 6-cornered.

13—1. ISANTHUS. 42. 39.

cœru'leus, (blue gentian, false pennyroyal. O. b. Ju. ☉.) viscid-hairy; leaves, lance-oval, acute at both ends, 3-nerved; peduncles 1 or 2-flowered.

3—1. IXIA. 6. 18.

chinen''sis, (blackberry lily. y. r. J. ♃.) corolla about 6-petalled; stem flexuose; leaves ensiform.

2—1. JASMINUM. 44. 37.

frut''icans, (jasmine. y. ♄.) leaves alternate, ternate, simple; leafets obovate, wedge-form, obtuse; branches angled.

officina'le, (jasmine. w. ♄.) leaves pinnate, opposite; leafets acuminate.

19—12. JUGLANS. 50. 94.

cine'rea, (butternut. O. M. ♄.) leafets numerous, lanceolate, serrate, rounded at the base, soft-pubescent beneath; petioles villose; fruit oblong-ovate, viscid, long-peduncled; not roughly sculptured.

6—1. JUNCUS. 5. 13.

effu'sus, (E. ♃.) scape minutely striate, (soft;) panicle loose, very branching; spreading; leafets of the calyx lanceolate, acuminate, rather longer than the obovate, obtuse capsule. 2—3 f.

21—3. JUNGERMANNIA. 57. 3.

complana'ta, stem branched, creeping; leaves roundish, very entire; ears sub-ovate, flattish. on smooth bark; very rarely on rocks.

palma'ta, frond short, somewhat ascending, digitate-palmate, nerveless. Dark green. Rotten wood, in wet places. *Remark.* Most of the Junger-manniæ are in fruit late in the spring; some however, in the winter.

10—1. KALMIA. 18. 50.

latifo'lia, (laurel. E. w. & r. Ju. ♄.) leaves long-petioled, scattered, and in threes, oval, smooth both sides; corymbs terminal, with viscid hairs. 3—20 f.

angustifo'lia, (sheep laurel. O. J. ♄.) leaves in threes, petioled, oblong, obtuse, sometimes rusty beneath; corymbs lateral; bracts linear; peduncles and calyx with glandular hairs. Var. *ovata*, taller; leaves broader, sub-ovate. 2—3 f.

17—1. LACTUCA. 49. 53.

elonga'ta, (wild lettuce. O. y. Ju. ♂ or ♃.) leaves smooth; lower ones runcinate, amplexicaul; upper ones lanceolate, sessile; flowers panicled. 4-6. f. *S.*

Exotic.

sati'va, (lettuce. y. Ju ⊙.) leaves roundish; cauline ones cordate; stem corymbed. Var. *romana*, has oblong, straight leaves, narrowed at the base. Var. *crispa*, has sinuate-crenate leaves, toothed, undulated, crispid; radical ones hairy on the keel. Var. *laciniata*, has the lower leaves pinnatifid, and the upper ones runcinate.

13—1. LAMIUM. 42. 39.

amplexicau'le, (dead-nettle. O. r. Nov. ⊙.) floral leaves broadly cordate, sessile, amplexicaul, crenate; radical leaves petioled. 6-10 in. *S.*

16—10. LATHYRUS. 32. 93.

Exotic.

odora'tus, (sweet pea. J. ⊙.) peduncles 2-flowered; tendril with 2 ovate oblong leafets; legumes hirsute.

latifo'lius, (everlasting pea. Au. ♃.) peduncles many-flowered; tendril with 2 lance-ovate leaves; membranaceous between joints.

9—1. LAURUS. 12. 27.

ben"zoin, (spice bush, fever bush. O. g. y. Ap. ♄.) leaves wedge-obovate, whitish sub-pubescent beneath; flowers in clustered umbels; buds and pedicels glabrous. 4—10 f.

sas"safras, (sassafras tree. O. y. M. ♄.) leaves entire and lobed on the same plant; flowers mostly diœcious. 10—25 f.

Exotic.

camphora'tus, (camphor tree. ♄.) leaves about 3-nerved, lance-ovate; panicle spreading. From Japan.

13—1. LAVANDULA. 42. 39.

Exotic.

spi'ca, (lavender. Au. ♃.) leaves sessile, lance-linear, with revolute margins; spike interruptedly naked.

3—2. LEERSIA. 4. 10.

virgin"ica, (white-grass. Ju. y. ♃.) panicle simple; the lower branches diffuse; flowers oppressed, monandrous, sparingly ciliate on the keel. 2—4 ft. *S.*

10—1. LEIOPHYLLUM. 18. 50.

buxifo'lium, (sand myrtle. E. w. ♄.) leaves small, lance-oval, entire, glabrous, lucid, revolute at the margin; corymbs terminal. 6—18 i.

17—1. LEONTODON. 49. 53.

tarax'acum, (dandelion. O. y. Ap. ♃.) outer calyx reflexed; scape 1-flowered, leaves runcinate, with toothed divisions. Introduced.

13—1. LEONURUS. 42. 39.

Exotic.

cardi'aca, (motherwort. w-r. Ju. ♃.) leaves 3-lobed, toothed, bases wedge-form: calyx prickly, less than the corolla. Naturalized. 2—4 f.

14—1. LEPIDIUM. 39. 63.

Exotic.

sati'vum, (peppergrass. w. Ju. ☉.) leaves oblong, many-cleft.

2—1. LEPTANDRA. 40. 40.

virgin''ica, (O. w. Ju—Aug. ♃.) leaves verticillate, in fours or fives, lanceolate, serrate, petioled. 3—4 f. *S.*

2—1. LIGUSTRUM. 44. 37.

vulga're, (prim. E. w. J. ♄.) leaves lanceolate, acutish; panicle compact. Perhaps introduced.

6—1. LILIUM. 10. 14.

philadel'phicum, (red lily. O. r. y. J. ♃.) leaves whorled, lance-linear: corolla erect, bell-form, spreading: petals lanceolate, having claws. 1–3 f.

canaden''se, (nodding lily. O. y. r. Ju. ♃.) leaves remotely whorled, lanceolate: peduncles terminal, elongated, mostly in threes: corolla nodding: petals spreading. 2—3 f.

super''bum, (superb lily. E. y. p. Ju. ♃.) leaves lance-linear, 3-nerved, glabrous: lower ones whorled; upper ones scattered; flowers in a pyramid-raceme, recurved; petals revolute. 3—6 f.

Exotic.

can''didum, (white lily. w. J. ♃.) leaves lanceolate, scattered, tapering to the base; corolla bell-form, glabrous within.

bulb''iferum, (orange lily. y. J. ♃.) leaves scattered, 3-nerved: corolla campanulate, erect, scabrous within.

2—1. LINDERNIA. 40. 40.

attenua'ta, (false hedge-hyssop. w-p. Ju. ☉.) leaves lanceolate and obovate, narrowed at the base; peduncle shorter than the leaves, erect. *S.*

4—1. LINNAEA. 48. 58.

borea'lis, (twin-flower. O. w. r. J. ♃.) stem prostrate; branches erect, each bearing 2 flowers: leaves roundish, crenate. Woods.

5—5. LINUM. 14. 82.

Exotic.

usitatis''simum, (flax. b. Ju. ☉.) leafets of the calyx ovate, acute, 3-nerved; petals crenate; leaves lanceolate, alternate; stem sub-solitary.

12—13. LIRIODENDRON. 52. 75.

tulipif''era, (white wood, tulip tree. O. y. r. J. ♄.) leaves truncate at the end, with 2 side lobes. A beautiful flowering tree. 90—150 f. *S.*

5—1. LOBELIA. 29. 52.

cardina'lis, (cardinal flower. O. r. Ju. ♃.) erect, simple, pubescent; leaves lance-ovate, acuminate, denticulate: racemes somewhat one-sided, many-flowered: stamens longer than corollas. Damp. 1—2 f.

infla'ta, (wild tobacco. O. b. Ju. ☉.) erect, branching, very hirsute; leaves ovate, serrate: racemes leafy: capsules inflated. 12—18 i.

kal''mii, (O. b. Ju. ☉.) slender, erect, sub-simple; radical leaves spatulate; cauline ones linear, delicately toothed; flowers racemed, alternate, remote, pedicelled. 6—24 i. *S.*

3—2. LOLIUM. 4. 10.

peren''ne, (E. M. ♃.) florets much longer than the calyx, unarmed, linear-oblong, compressed. Introduced. 18 i.

5—1. LONICERA. 48. 58.

semper''virens, (E. r. y. M. ♄.) spikes with distant, nakedish whorls: corollas sub-equal; tube ventricose above; leaves ovate and obovate, glaucous beneath; upper ones connate-perfoliate. Leaves perennial. *S.*

Exotic.

caprifo'lium, honeysuckle. ♄.) corollas ringent-like, terminal: sessile leaves connate-perfoliate at the top.)

periclym''enum, (woodbine. J. ♄.) flowers in ovate, imbricate, terminal heads: leaves all distinct. Var. *quercifolia*, leaves sinuate.

4—1. LUDWIGIA. 17. 88.

pilo'sa, (O. y. Ju. ♃.) stem erect, branched, hairy: leaves alternate. oblong, sessile: peduncles 1-flowered, axillary: capsules globose, quadrangular. Swamps. S.

14—1. LUNARIA. 39. 63.

Exotic.

an''nua, (honesty. p. ♂.) leaves obtusely toothed: silicles oval, obtuse at both ends. Naturalized.

redivi'va, (satin flower. b-p. ♃.) leaves with mucronate teeth: silicles tapering to both ends. Flowers odorous.

17—10. LUPINUS. 32. 93.

peren''nis, (wild-lupine. O. b. M. ♃.) stem and leaves smoothish: leaves digitate, with about 8 to 10 leafets, which are oblanceolate, obtusish: calyxes alternate, not appendaged: banner emarginate, keel entire. 12—18 i. *S.*

Exotic.

hirsu'tus, (garden lupine. b. ⊙.) calyxes appendaged, alternate: banner 2-parted; keel 3-toothed.

10—5. LYCHNIS. 22. 82.

Exotic.

chalcedon''ica, (scarlet lichnis. r. J. ♃.) flowers fascicled, level-top, or convex.

floscuc''uli, (ragged robin. ♃.) petals torn: capsule 1-celled, roundish.

4—1. LYCIUM. 28. 41.

Exotic.

bar''barum, (matrimony vine. J. r. y. ♄.) stem angled: branches erect: leaves lanceolate, tapering to both ends: calyx mostly 3-cleft.

21—6. LYCOPERDON. 58. 1.

bovis''ta, (common puff-ball. O.) at first white and obconic, becoming black and spherical: outer coat downy, which pealing off, leaves the leathery inner coat: seeds black, lighter than air, and appearing like smoke. In meadows.

21—1. LYCOPODIUM. 55. 5.

complana'tum, (ground-pine. E. g-y. Ju. ♃.) creeping, erectish: branches alternate, dichotomous: leaves bifareous, connate, spreading at the tips: spikes in pairs, peduncled. Woods. *S.*

2—1. LYCOPUS. 42. 39.

europe'us, (water horehound. w. Au. ☉.) smooth; stem acutely 4-cornered; leaves narrow-lanceolate, with large acute teeth; lower ones somewhat pinnatifid: segments of the calyx acuminate, terminating in short spines. 1—2 f. *S.*

5—1. LYSIMACHIA. 20. 34.

stricta, (loose strife. O. y. Ju. ♃.) raceme terminal, very long, lax; leaves opposite, lanceolate, sessile; petals lanceolate, spreading. 1—2 f. *S.*

cilia'ta, (O. y. J. ♃.) sub-pubescent; leaves opposite, long-petioled, subcordate-oval; petioles ciliate; pedicels somewhat in pairs; flowers nodding. 2—4 f. *S.*

quadrifo'lia, (♃.) branching; stem smooth; leaves sessile, opposite, very long linear; peduncles in fours, sub-terminal, 1-flowered. 2—3 f. *S.*

13—1. MACROTYS. 26. 61.

racemo'sa, (bug-bane, black snake-root, cohosh. O. w. Ju. ♃.) leaves decompound; leafets oblong-ovate, gash-toothed; racemes in wand-like spikes; capsules ovate. Woods. 3—9 f. *S.*

12—13. MAGNOLIA. 52. 75.

Southern.

grandiflo'ra, (big laurel, magnolia. O. w. M. ♄.) leaves evergreen, oval, thick, leathery; petals broad-obovate, abruptly narrowed into a claw. 60—80 f.

15—13. MALVA. 37. 74.

rotundifo'lia, (low mallows. O. r. w. J. ♃.) leaves heart-orbicular, obsoletely 5-lobed; peduncles bearing the fruit declined; stem prostrate. Probably introduced.

Exotic.

sylves'tris, (mallows. r-b. J. ♂. and ♃.) stem erect; leaves about 7-lobed, acutish; peduncles and petioles hairy.

crispa, (curled mallows. Au. ☉.) stem erect; leaves angular, crisped; flowers axillary, glomerate.

21—3. MARCHANTIA. 57. 3.

polymor'pha, (brook liverwort. O. g-y. Ju. ♃.) pistillate receptacles radiated; staminate ones peduncled, peltate; fronds crowded together, lobed, nerved, and covered with small decussate veins. Pistillate peduncles very long: nerves of the frond generally brown. On earth and stones in wet or damp places.

13—1. MARRUBIUM. 42. 39.

vulga're, (horehound. O. w. Ju. ♃.) leaves round ovate, toothed, rugose-veined: calyx toothed, setaceous, uncinate. Introduced. *S.*

14—2. MELAMPYRUM. 40. 35.

america'num, (cow-wheat. O. y. Ju. ☉.) slender: lower leaves linear, entire; floral ones lanceolate, toothed behind: flowers axillary, distinct. Var. *latifolium*, has very broad leaves. Woods. *S.*

16—10. MELILOTUS. 32. 93.

alba, (white melilot-clover. w. J. ☉.) stem erect: leafets variable (oval, ovate, obovate, and oblanceolate) mucronately serrulate: banner *longer*[*] than the wings: racemes axillary, panicled: the longest raceme

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[*] Suggested by H. H. E.

6 to 10 times as long as the longest leafet at its base: legumes oval. 3 to 6 f. Probably introduced; but now very common and growing wild. *S.*

13—1. MELISSA. 42. 39.

Exotic.

officina'lis, (balm. w. b. Ju. ♃.) flowers whorled half way round, sub-sessile; bracts oblong, pedicelled; leaves ovate, acute, serrate. Naturalized.

20—13. MENISPERMUM. 11. 77.

canaden"se, (moonseed. O. y. Ju. ♃.) leaves peltate, cordate, round-angular; racemes compound; petals 8. *S.*

13—1. MENTHA. 42. 39.

Exotic.

piperi'ta, (peppermint. p. Au. ♃.) spikes obtuse, interrupted below; leaves subovate, somewhat glabrous, petioled; stem glabrous at the base. Naturalized. 1—2 f.

vir"idis, (spear-mint. p. Au.) leaves lanceolate, sessile; spikes elongated, interrupted; stamens long. 1—2 f.

11—5. MESEMBRYANTHEMUM. 13. 87.

Exotic.

crystalli'num, (ice plant. w. Au. ☉.) branching; leaves alternate, ovate, papillose; flowers sessile: calyx broad-ovate, acute, retuse.

17—1. MIKANIA. 49. 55.

pubes"cens, (w-p. S. ♃.) stem climbing, pubescent: leaves cordate, acuminate, angularly dentate, pubescent on both sides; divaricate, equal. *S.*

13—2. MIMULUS. 40. 40.

ringens, (monkey-flower. O. b. Ju. ♃.) erect, glabrous; leaves sessile, lanceolate, acuminate, serrate; peduncles axillary, opposite, longer than the flower; teeth of the calyx acuminate. 1—2 f. *S.*

5—1. MIRABILIS. 54. 32.

Exotic.

jal"apa, (four o'clock. r. y. Ju. ♃.) flowers heaped, peduncled; leaves glabrous.

4—1. MITCHELLA. 48. 57.

re'pens, (O. w. Ju. ♃.) stem creeping, branched; leaves smooth, roundish, opposite. Woods. *S.*

10—2. MITELLA. 13. 84.

diphyl"la. (O. w. M. ♃.) leaves somewhat lobed; lobes acute, dentate; stem erect, with 2 opposite leaves above the middle. 12—18 i.

13—1. MOLUCCELLA. 42. 39.

Exotic.

lae'vis, (molucca balm, shell-flower. w-g. Ju. ☉.) calyx campanulate, 5-toothed; teeth equal, awnless; leaves petioled, round-ovate, toothed.

3—3. MOLLUGO. 22. 82.

verticilla'ta, (carpet weed. O. w. Ju. ☉.) leaves verticillate, wedge-form, acute; stem branched, depressed; peduncles 1-flowered. *S.*

19—15. MOMORDICA. 34. 97.

echina'ta, (O. w. Au. ⊙.) pomaceous; berry 4-seeded, roundish, setose-echinate; leaves cordate, 5-lobe-angled, acuminate, entire. Calyx 6-cleft; corolla 6-parted.

2—1. MONARDA. 42. 39.

did'yme, (mountain mint. O. r. J. ♃.) leaves ovate, acuminate, sub-cordate, somewhat hairy; flowers in simple or proliferous heads; outer bracts large, coloured, lanceolate. Var. *angustifolia*, leaves lance-ovate, acuminate, pubescent; stem pubescent. 18—24 i. *S.*

10—1. MONOTROPA. 18. 51.

uniflo'ra, (bird's nest, indian pipe. O. w. J. ♃.) stem 1-flowered; flower nodding at first, at length erect; scales of the stem approximate. Whole plant ivory-white at first. 4—8 i.

19—4. MORUS. 53. 98.

Exotic.

alba, (white mulberry. M. ♄.) leaves heart-form, with oblique bases, ovate or lobed, unequally serrate, smoothish. From China and Persia. Naturalized. 15—20 f.

21—6. MUCOR. 58. 1.

aspergil''lus, (mould,) stipe filiform, dichotomous: little heads terminal, sub-conjugate, oblong when mature. On putrid fungi in autumn.

5—1. MYOSOTIS. 41. 42.

arven''sis, (forget-me-not. E. w-b. J. ⊙.) seeds smooth: calyx leaves oval, acuminate, very hirsute, longer than the tube of the corolla: stem very branching: racemes conjugate: leaves lance-oblong, hirsute. 4—8 i. *S.*

Southern.

na'na, (b. &. y. ♃.) leaves oblong, villose: racemes few-flowered: seeds smoothish; marginate serrulate.

11—1. MYRTUS. 19. 39.

Exotic.

commu'nis, (myrtle. w. Ju. ♄.) flowers solitary: involucrum 2-leaved: leaves ovate.

6—1. NARCISSUS. 9. 17.

Exotic.

pseudo-narcis''sus, (daffodil. M. ♃.) spatha 1-flowered: nectary bell-form, erect, crisped, equalling the the ovate petals.

tazet''ta, (polyanthos. M. ♃.) spatha many-flowered: nectary bell-form, plicate, truncate, thrice as short as the petals: petals alternately broader: leaves flat.

jonquil''la, (jonquil. M. ♃.) spatha many-flowered: nectary bell-form, short: leaves subulate.

poet''icus, (poet's narcissus. ♃.)spatha 1-flowered: nectary wheel-form, very short, scarious, (red,) crenulate: leaves inflexed at the margin.

19—1. NEOTTIA. 7. 21.

tor''tilis, (summer ladies'-tresses. (O. w. Ju. ♃.) radical leaves linear: scape sheathed; flowers spirally secund; lip somewhat 3-lobed; middle lobe larger, crenulate. 12 i. *S.* Var. *gracilis*, radical leaves ovate, caducous, membranaceous.

13—1. NEPETA. 42. 39.

cata'ria, (cat mint, catnep. O. b-w. ♃.) hoary-pubescent; flowers in whorled spikes; leaves petioled, cordate, tooth serrate.

5—1. NICOTIANA. 28. 41.

Exotic.

taba'cum, (virginian tobacco. w-r. Ju. ☉.) leaves lance-ovate, sessile, decurrent; flowers acute. Naturalized.

21—4. NOSTOC. 57. 2.

commu'ne, on the earth; frond plated-lobed, ventricose, gelatinous.—On the earth after a storm, an inch or two in extent, olive green.

12—1. NUPHAR. 13. 62.

kalmia'na, (O. Ju. ♃.) leaves cordate, lobes near each other; calyx 5-leaved; stigma gashed, with 8 to 12 radiated lines.—Flowers small. Water.

12—1. NYMPHAEA. 13. 62.

odora'ta, (pond-lily. O. w. Ju. ♃.) leaves round-cordate, entire, sub-emarginate; lobes spreading asunder, acuminate, obtuse; petals equalling the 4-leaved calyx. *S.*

13—2. OBOLARIA. 40. 35.

virgin''ica, (penny-wort. E. r. Ap. ♃.) stem simple; leaves oblong, truncate, fleshy, purple beneath; flowers axillary, solitary, sessile. 3—4 i. *S.*

8—1. ŒNOTHERA. 17. 88.

Capsules elongated, sessile.

bien''nis, (scabish, tree-primrose. O. y. J. ♂.) stem villose, scabrous; leaves lance-ovate, flat, toothed; flowers sub-spiked, sessile; stamens shorter than the corolla. 3—5 f.

parviflo'ra, (E. y. Ju. ♂.) stem smooth, sub-villose; leaves lance-ovate, flat; stamens longer than the corolla.

21—1. ONOCLEA. 55. 5.

sensib''ilis, (sensitive fern. O. J. ♃.) barren frond pinnate; fertile one doubly-pinnate; stem glabrous. The leafets slowly approach each other, on squeezing the stem in the hand. *S.*

18—1. ORCHIS. 7. 21.

Roots oval, or palmate.

specta'bilis, (O. r. M. ♃.) lip obovate, undivided, crenate, retuse; petals straight; lateral ones longest; spur clavate, shorter than the germ; bracts longer than the flowers; stem leafless. 3—6 i. *S.*

13—1. ORIGANUM. 42. 39.

vulga're, (wild marjoram. O. r. Ju. ♃.) spikes round panicled, heaped; bracts ovate, longer than the calyx. 1—2 f. *S.*

Exotic.

majora'na, (sweet marjoram. ♄.) spikes roundish, ternate, compact, peduncled; leaves petioled, oval, obtuse, smoothish. 6—12 i.

6—1. ORNITHOGALUM. 10. 16.

umbella'tum, (star of Bethlehem. M. ♃.) flowers corymbed, peduncles longer than the bracts: filaments subulate. Naturalized. 6—8 i.

13—2. OROBANCHE. 40. 35.

uniflo'ra, (cancer-root. O. b-w. M. ♃.) stem very short: peduncles 2, elongated, scape-form, 1-flowered, naked: scales smooth, concave: lobes of the corolla oblong-oval, with a pubescent coloured margin. 4—6 i. *S.*

6—2. ORYZA. 4. 10.

sati'va, (rice. ☉.) culm jointed: leaves clasping: panicle terminal.

21—1. OSMUNDA. 55. 5.

cinnamo'mea, (flowering fern. O. y. J. ♃.) barren frond doubly pinnatifid; segments oval, entire: fertile fronds with opposite racemes, woolly. 3—6 f. *S.*

10—5. OXALIS. 14. 73.

acetosel'la, (wood-sorrel. O. w. r. M. ♃.) stemless: scape 1-flowered, longer than the leaves: leaves ternate, broad obcordate, with rounded lobes: styles as long the inner stamens: root dentate.

8—1. OXYCOCCUS. 18. 51.

macrocar''pus, (cranberry. O. r. J. ♄.) creeping: stem ascending; leaves oblong, flattish, obtuse, becoming white beneath; pedicels elongated; divisions of the corolla lance-linear. Wet.

12—3. PÆONIA. 36. 61.

officina'lis, (peony. r. J. ♃.) leaves decompound; leafets lobed, lobes broad-lanceolate; capsules downy.

5—2. PANAX. 46. 59.

quinquefo'lia, (ginseng. C. w. M. ♃.) root fusiform; leaves ternate, quinate; leafets oval, acuminate, petioled serrate. Larger than the last. 1—2 f. *S.*

3—2. PANICUM. 4. 10.

crus-gal''li, (barn grass. O. Au. ☉.) racemes alternate and in pairs, compound rachis 5-angled; glumes terminating in hispid bristles; sheath glabrous. 2—4 f. *S.*

12—1. PAPAVER. 27. 62.

Exotic.

somnif''erum, (opium poppy. J. ☉.) calyx and capsule glabrous; leaves clasping, gashed, glaucous.

21—5. PARMELIA. 57. 2.

capera'ta, (shield lichen.) frond orbicular, pale yellow becoming green, rugose, at length granulated, dark and hispid beneath; lobes plicate, sinuate-laciniate, roundish, somewhat entire; receptacles scattered, subfuscous; margin incurved, entire, at length pulverulent. On old timber, &c.

5—4. PARNASSIA. 14. 64.

america'na, (flowering plantain. w. y. p. Ju. ♃.) leaves radical (often a leaf on the scape) heart-orbicular, 5 to 9-nerved; nectaries five, each divided into 3 filaments terminated by little spherical heads. Damp or wet. 6—18 i.

15—5. PASSIFLORA. 34. 97.

Exotic.

cœru'lea, (blue passion-flower. b. Ju. ♄.) leaves palmate, 5-parted, entire; petioles glandular; involucrum 3-leaved, entire; threads of the crown shorter than the corolla.

5—2. PASTINACA. 45. 60.

Exotic.

sati'va, (parsnip. y. Au. ♂.) leaves simply pinnate; leafets glabrous. Var. *arvensis*, leafets sub-pubescent. This variety is often found in situations which almost prove it to be indigenous.

13—2. PEDICULARIS. 40. 35.

canaden"sis, (louse-wort. O. y-p. M. ♃.) stem simple; leaves pinnatifid, gash-toothed; heads leafy at the base, hirsute; corolla with a setaceous, 2-toothed upper lip; calyx obliquely truncate. 6—12 i. *S.*

15—7. PELARGONIUM. 14. 73.

Exotic.

1. *Nearly stemless: root tuberous.*

triste, (mourning geranium.) umbel simple; leaves rough-haired, pinnate; leafets bipinnatifid; divisions oblong-acute. Flowers dark green.

daucifo'lium, (carrot geranium. ♃.) scape very simple; leaves thrice pinnate, hirsute; leafets lance-linear.

2. *Leaves simple, not angled.*

odoratis"simum, (sweet-scented geranium. ♄.) peduncles sub-5-flowered: leaves round cordate very soft.

3. *Leaves simple, more or less angled, or lobed.*

zona'le, (horse-shoe geranium. ♄.) umbels many-flowered: leaves heart-orbicular, obsoletely lobed, toothed, with a coloured zone or band around near the margin.

in"quinans, (scarlet geranium. ♄.) umbels many-flowered: leaves round reniform, hardly divided, crenate, viscid-downy.

acerifo'lium, (lemon or maple leaf geranium. ♄.) umbels about 5-flowered; leaves 5 lobe-palmate, serrate; below wedge-form, undivided.

capita'tum, (rose-scented geranium. ♄.) flowers capitate: leaves cordate, lobed, waved, soft: stem diffuse.

quercifo'lium, (oak-leaf geranium. ♄.) umbels sub-many-flowered: leaves cordate, pinnatifid, crenate: sinuses rounded: filaments ascending at the apex.

grave'olens, (sweet-rose geranium. ♄.) umbels many-flowered, sub-capitate: leaves palmate-7-lobed; divisions oblong, obtuse; margins revolute.

10—5. PENTHORUM. 13. 83.

sedo'ides, (virginian orpine. O. g-y. Ju. ♃.) stem branching, angled; leaves lanceolate, sub-sessile, unequally and densely serrate; spikes secund, terminal, panicled, alternate and cymed; seeds pitted. 12—18 i. *S.*

13—2. PENTSTEMON. 40. 45.

pubes"cens, (beard-tongue. O. w-p. J. ♃.) stem hairy; leaves serrulate, lance-oblong, sessile; flowers panicled; the barren filament bearded from the apex to below the middle. Var. *latifotia*, has broad smooth leaves. Var. *angustifotia*, has narrow, hairy, obscurely denticulate leaves. 1—2 f. *S.*

3—2. PHALARIS. 4. 10.

america'na, (ribbon grass, wild canary grass. E. Ju. ♃.) panicle oblong, spiked; glumes of the calyx boat-shaped, serrulate; corolla unequal: rudiments hairy. Var. *picta*, leaves variously striped. This variety is the ribbon grass of the gardens. 2.—5 f. *S.*

16—10. PHASEOLUS. 32. 93.

Exotic

luna'tus, (carolina bean, lima bean. g-w. Ju. ⊙.) twining; legumes scymitar-form, sub-lunate, smooth; seeds compressed.

vulga'ris, (common-pale-bean. p. w. Ju. ⊙.) stem twining; racemes solitary, shorter than the leaves; peduncles in pairs; bracts smaller than the calyx, spreading; legumes pendulous. From the East Indies.

na'nus, (bush bean, six weeks bean. ⊙.) stem erect, smooth: bracts larger than the calyx; legumes pendulous, compressed, rugose. Seeds variously coloured.

11—1. PHILADELPHUS. 19. 89.

Exotic.

corona'rius, (mock orange, false syringa. w. J. ♄.) styles distinct; leaves ovate, sub-dentate.

3—2. PHLEUM. 4. 10.

praten"se, (timothy grass. O. J. ♃. and ♂.) spike cylindric, calyx mucronate-awned; keel ciliate; awn shorter than the calyx; culm erect. Introduced. 2—3 f. *S.*

5—1. PHLOX. 20. 44.

panicula'ta, (smooth-stem lichnidia. r. w. Ju. ♃.) glabrous, erect: leaves lanceolate, narrowing gradually, flat; margins rough; corymbs panicled: divisions of the corolla rounded: calyx awned. Cultivated. 2—3 f. *S.*

subula'ta, mountain pink. O. r. M. ♃.) cæspitose, white pubescent: leaves linear, pungent, ciliate: corymbs few flowered: pedicels 3-cleft: divisions of the corolla wedge-form, emarginate; teeth of the calyx subulate, scarcely shorter than the tube of the corolla. Cultivated. 3—6 i. *S.*

10—10. PHYTOLACCA. 54. 29.

decan"dra, (poke-weed. O. w. Ju. ♃.) leaves ovate, acute at both ends: flowers racemed: berries flattened at the ends. 3—6 f. *S.*

19—16. PINUS. 51. 100.

I. *Leaves solitary, with separate bases.* ABIES.

canaden"sis, (hemlock tree. O. M. ♄.) leaves flat, denticulate, 2-ranked: strobiles ovate, terminal, scarcely longer than the leaves. The bark is used in tanning leather. *S.*

2. *Leaves many, sheathed at the base.* PINUS.

(*Leaves in pairs.*)

resino'sa, (yellow pine, norway pine, red pine. O. M. ♄.) leaves and sheaths elongated: strobiles ovate-conic, rounded at the base, sub-solitary, about half as long as the leaves: scales dilated in the middle, unarmed. Bark of a reddish colour, and much smoother than the rigida and strobus. Often grows very tall and straight. *S.*

(*Leaves in threes.*)

rig"ida, (pitch pine. O. M. ♄.) leaves with abbreviated sheaths; staminate aments erect-incumbent: strobiles ovate, scattered or aggregated: spines of the scale reflexed. Though very common, it grows the most plentifully on barren sandy plains. *S.*

3. *Leaves many, in a fascicle.* LARIX.

pen"dula, (black larch, tamarack, hack-matack. O. M. ♄.) leaves deciduous: strobiles oblong: margins of the scales inflexed: bract guitar-form, with a slender point.

16—10. PISUM. 32. 93.

Exotic.

cati'vum, (pea, p. w. J. ⊙.) petioles terete : stipules round and crenate at the base : peduncles many-flowered. Var. *umbellatum*, (boquet pea,) has the stipules 4-cleft, acute. Var. *quadratum*, (quadrate pea,) fruit ash-colour, 4-sided. Var. *humile*, (dwarf pea,) stem erect, not climbing : leafets roundish.

4—1. PLANTAGO. 54. 31.

ma'jor, (plantain. O. w. J. ♃.) leaves ovate, sub-dentate, sub-glabrous : scape terete : spike oblong, imbricate. 6--24 i. *S.*

20—13. PLATANUS. 50. 99.

occidenta''lis, (button wood, american plane-tree, false sycamore. O. J. ♄.) leaves quinquangular, obsoletely lobed, toothed; pubescent beneath : stem and branches becoming white. Grows to a greater size than any other tree in America.

3—2. POA. 4. 10.

Remarks. The word *poa* is pure Greek, and signifies pasture or fodder. Linnæus applied the name to this genus, because it includes the most common *pasture grass* and *meadow grass.* The poa pratensis, aided by the agrostis vulgaris, constitutes most of those beautiful carpets which cover our fields, lawns, and road-sides.

an''nua, (Ap. ⊙.) panicle sub-secund, divaricate : spikelets ovate-oblong, 5-flowered : florets free : culm oblique, compressed : root fibrous. 6—8 i. *S.*

praten''sis, (O. J. ♃.) panicle diffuse : upper leaves much shorter than the the smooth sheaths : florets acute, 5-nerved, webbed at the base : stipule short truncate : root creeping. 2—3 f. *S.*

12—1. PODOPHYLLUM. 27. 61.

pelta'tum, (wild mandrake, may-apple. O. w. M. ♃.) stem terminated with 2 peltate palmate leaves : flower single, inserted in the fork, formed by the petioles of the leaves. Sometimes the plant is 3-leaved, and sometimes the flower is inserted on the side of one of the petioles. 1—2 f. *S.*

18—1. POGONIA. 7. 21.

ophioglosso'ides, (snake mouth arethusa. O. r. Ju. ♃.) root fibrous : scape with 2 distant leaves, 1 or 2-flowered : leaves, lance-oval : lip fringed. 8—12 i. *S.*

6—1. POLYANTHES. 10. 17.

Exotic.

tubero'sa, (tuberose. ♃.) flowers alternate, in pairs : rootlets tuberous : scape scaly : leaves linear, long. Sweet scented.

16—6. POLYGALA. 33. 35.

paucifo'lia, (flowering wintergreen. O. r. M. ♃) small, large-flowered : stem simple, erect, naked below : leaves ovate, acute, glabrous, near the top of the stem : flowers crested, terminal, about in threes. 3—4 i. *S.*

sen''ega, (seneca snake-root, mountain flax. O. r. or w. J. ♄.) stem erect, simple, leafy : leaves alternate, lanceolate : spike terminal filiform : flowers alternate, not crested. Var. *albida*, leaves lanceolate or oval : spike somewhat crowded : flowers white, sub-sessile. 8—14 i. *S.*

polyg''ama, rubella of wildenow, (ground flower. O. p. J. ♃.) stems numerous : leaves linear-oblong, alternate downwards : racemes terminal and lateral, elongated ; flowers sessile : radical racemes procumbent, with apterous flowers. 4—8 in.

8—3. POLYGONUM. 12. 28.

avicula're, (knot-grass. O. w. M. ♃.) stamens 8, styles 3 : leaves lanceolate, scabrous at the margin : stipules short, lacerate : stem procumbent : flowers sub-sessile, axillary, minute. 6—12 i. *S.*

Exotic.

fagop''yrum, (buck-wheat. r-w. Ju. ⊙.) stamens 8: styles 3: racemes panicled: leaves heart-sagittate: stem erectish, unarmed: angles of the seeds equal. 1—2 f.

21—1. POLYPODIUM. 55. 5.

vulga're, (polypod. O. Ju. ♃.) frond deeply pinnatifid; divisions lance-linear, obtuse, crenulate, approximate, upper ones gradually smaller: fruit dots solitary: root chaffy. 8—12 i. *S.*

21—2. POLYTRICHUM. 56. 4.

juniperi'num, (hair-cap moss. O. M. ♃.) stem generally simple: leaves lance-linear, entire, flattish, somewhat spreading: the apophysis depressed. In dry woods, &c.

6—1. PONTEDERIA. 6. 17.

corda'ta, (pickerel weed. O. b. Ju. ♃.) leaves heart-oblong, obtuse: spike many-flowered, compact: divisions of the corolla oblong. Var. *angustifolia*, leaves elongated-triangular, truncate and sub-cordate at the base. 1—2 f.

20—8. POPULUS. 50. 99.

tremulo'ides, (white poplar, american aspen. E. Ap. ♄.) leaves heart-roundish, abruptly acuminate: tooth-serrulate, glabrous, a little pubescent at the margin, with two glands at the base on the upper side: petioles compressed, in the young state silky. 20—30 f.

Exotic.

dilata'ta, (lombardy poplar, italian poplar, Ap. ♄.) leaves glabrous both sides, acuminate, serrate, deltoid, the breadth equal to or exceeding the length: branches erect, close to the stem. It is said no pistillate plant of this species has been brought to America. Consequently no seeds are obtained from it, and it has not been re-produced here from seed. 40—80 f.

12—1. PORTULACCA. 54. 86.

olera'cea, (purslane. O. y. J. ⊙.) leaves wedge form: flowers sessile. *S.*

11—13. POTENTILLA. 35. 92.

Leaves digitate in fives, rarely in sevens.

canaden''sis, (common five-finger. O. y. M. ♃.) procumbent, sub-ramose, whitish-silky: stipules ovate, gashed: leaves wedge-obovate, gash-toothed: stem ascending and creeping, hirsute: peduncles solitary, elongated: divisions of the calyx lance-linear: petals orbicular, sub-entire, of the length of the calyx. This plant is so long in flower, and assumes so many forms and sizes, that students in botany often make several species of it. 2—18 i. *S.*

argen''tea, (silver five-finger. O. w-y. Ju. ♃.) stem prostrate and ascending, rarely sub-erect, branching, white-downy: stipules ovate-acute; leaves wedge-form, gash-toothed, silvery white down beneath: petals retuse, scarcely longer than the calyx. 4—10 i. *S.*

Leaves more or less pinnate.

anseri'na, (tansey cinquefoil. O. y. J. ♃.) creeping: leaves interruptedly pinnate, numerous, gash-serrate, silky, white-downy beneath: peduncles solitary, 1-flowered.

19—13. POTERIUM. 54. 92.

Exotic.

sanguisor''ba, (burnet. J. ♃.) stem somewhat angled, unarmed: leaves pinnate; leafets serrate: flowers in heads.

17—1. PRENANTHES. 49. 53.

alba, (white lettuce. O. w. p. Au. ♃.) radical leaves angled, hastate, toothed, somewhat lobed; cauline ones round-ovate, toothed, petioled; upper ones most lanceolate: panicle lax; the terminal fascicle nodding: calyx 8-cleft, 9 or 10-flowered. Var. *nana*, Bw. low: leaves 3-parted, hastate, ovate and lanceolate, sometimes all simple: racemes panicled or simple. 1—3 f. *S.*

5—1. PRIMULA. 21. 34.

Exotic.

aca'ulis, (primrose. ♃.) leaves rugose, toothed, hirsute beneath: scape 1-flowered.

auric''ula, (auricula primrose. ♃.) leaves serrate, fleshy, obovate: scape many-flowered: calyx mealy.

14—1. PRUNELLA. 42. 39.

vulga'ris, var. *pennsylvanica*, (heal-all, self-heal. O. J. ♃.) leaves petioled, oblong-ovate, toothed at the base: lips of the calyx unequal; upper one truncate, awned: stem ascending. 6—12 i. *S.*

12—1. PRUNUS. 36. 92.

Flowers in racemes.

virginia'na, (wild cherry, rum cherry, cabinet cherry. O. w. M. ♄.) racemes erect, elongated: leaves oval-oblong, acuminate, unequally serrate, glabrous both sides: petioles generally bearing 4 glands. In open fields the limbs of this tree spread out into an elegant oval top; but in dense forests it grows to a very great height, with a few contracted branches. S.

seroti'na, (choke-berry. O. w. J. ♄.) flowers in lax racemes: leaves oval short-acuminate, opake, doubly and acutely serrate: midrib bearded on each side towards the base: petiole with 2 glands. This and the preceding species have been confounded by many Botanists. *S.*

canaden''sis, (O. w. ♄.) flowers in racemes: leaves glandless, broad-lanceolate, rugose, sharply serrate, pubescent both sides, tapering into the petiole. *S.*

Exotic.

spino'sa, (English sloe. ♄.) peduncles solitary: leaves lance-oval, pubescent beneath: fruit straight: branches thorny.

cer''asus, (garden cherry. w. r. ♄.) umbel sub-peduncled: leaves lance-ovate, glabrous, conduplicate.

domes''tica, (plumb. w. M. ♄.) peduncles sub-solitary: leaves lance-ovate, convolute, branches thornless. Var. *juliana*, (damson plum) fruit oblong, blue. Var. *claudiana*, (sweet plum, horse plum) fruit round, at first green, becoming yellowish. Var. *enucleata*, (stoneless plum) the putamen obsolete.

21—1. PTERIS. 55. 5.

aquili'na, (common brake. O. Ju. ♃.) frond pinnate, 3-parted: barren branches doubly pinnate, with leafets lance-linear, obtuse-pinnatifid, toothed; fertile branches pinnate, with leafets pinnatifid; divisions acutish, all ciliate. *S.*

10—1. PTEROSPORA. 18. 51.

androm''eda, (Albany beech-drops. E. r-y. Ju. ☉.) scape purple, very tall bearing a many-flowered raceme: flowers lateral and terminal, nodding: peduncles filiform, longer than the flowers: lanceolate scales below, none above. 1—2 f.

11—1. PUNICA. 36. 92.

Exotic.

grana'tum, (pomegranate. ♄.) leaves lanceolate: stem woody.

13—1. PYCNANTHEMUM. 42. 39.

Stamens exsert.

in''canum, (wild basil, mountain mint. O. w. r. Ju. ♃.) leaves oblong-ovate, acute, sub-serrate, white downy: flowers in compound heads, lateral ones peduncled: bracts setaceous. 1—5 f. *S.*

10—1. PYROLA. 18. 51.

rotundifo'lia, (shin-leaf, pear-leaf wintergreen. O. w. J. ♃.) style declined: leaves rounded or broad-oval obsoletely serrulate, sub-coriaceous, shining: petiole about as long as the lamina: scape many-flowered. 6—12 i.

ellip'tica, (O. g-w. Ju. ♃.) leaves membranaceous, elliptical-ovate, serrulate rather acute, lamina longer than the petiole: scape nearly naked: bracts subulate: calyx 5-toothed: style declinate, scape 10 in.

11—5. PYRUS. 36. 92.

corona'ria, (crab apple. O. w-r. M. ♄.) leaves broad oval, at the base rounded, sub-angled or sub-lobed, serrate, smooth: peduncles corymbed. Flowers sweet scented. *S.*

Exotic.

commu'nis, (pear. E. w-r. M. ♄.) leaves ovate, serrate, (rarely entire): peduncles corymbed.

ma'lus, (apple. E. w-r. M. ♄.) flowers in sessile umbels: leaves ovate-oblong, acuminate, serrate, glabrous: claws of the petals shorter than the calyx: styles glabrous. Var. *sylvestris*, (wild apple) leaves ovate serrate: fruit small, austere.

cydo'nia, (quince. E. w. J. ♄.) flowers solitary: fruit tomentose: leaves ovate, entire.

Remark. The varieties into which the above species have been extended by culture, are very numerous.

19—2. QUERCUS. 50. 99.

alba, (white oak. O. M. ♄.) leaves oblong, sinuate-pinnatifid, pubescent beneath; lobes obtuse, entire, narrowed at their bases, particularly on full-grown trees: fruit peduncled: calyx somewhat bowl-form, tubercled flattened at the base: acorn ovate. The most useful timber-tree in America. 70—80 f. *S.*

12—13. RANUNCULUS. 26. 61.

Leaves divided.

aborti'vus, (O. y. M. ♃.) glabrous: stem striate, naked below: radical leaves heart-reniform, obtusely crenate; cauline ones petioled, ternate, angled: upper ones sessile: branches about three-flowered. 9—15 i. *S.*

re'pens, (O. y. M. ♃.) pubescent: leaves ternate, 3-cleft, gashed: creeping shoots sent off in the summer: peduncles furrowed: calyx spreading. Damp.

a'cris, (crowfoot, butter cup. O. y. M. ♃.) hairs close-pressed: leaves 3-parted, many-cleft; upper ones linear: peduncles terete: calyx spreading. 1—2 f.

14—2. REPHANUS. 39. 63.

Exotic.

sati'vus, (garden radish. w. J. ⊙.) leaves lyrate: silique terete, torose, 2-celled. There are several varieties of this species—one has a fusiform, another a globose, another a black root.

9—3. RHEUM. 12. 28.

Exotic.

palma'tum, (rhubarb. J. ♃.) leaves palmate, acuminate. From China.

rhapon''ticum, (pie rhubarb. w. J. ♃.) leaves heart-ovate, obtuse and acute, smooth: veins sub-pilose beneath, the sinus at the base dilated: petioles furrowed on the upper side, rounded at the edge. Radical leaves very large. 2—4 f.

10—1. RHODODENDRON. 18. 50.

max"imum, (wild rosebay. E. r. Ju. ♄.) leaves oblong, glabrous, paler beneath: umbels terminal, dense: corollas somewhat bell-form. 4—20 f.

Exotic.

pon"ticum, (rose bay. p. ♄.) leaves oblong, glabrous, both sides coloured alike: corymbs terminal: corolla bell-wheel-form: petals lanceolate.

5—3. RHUS. 43. 94.

glabrum, (sleek sumach. O. g. r. Ju. ♄.) branches, petioles and leaves glabrous: leaves pinnate, many paired; leafets lance-oblong, serrate, whitish beneath: fruit silky. The leaves of both the species are used for tanning morocco leather. Berries red and sour. 6—12 f.

ver"nix, (poison sumach. y-g. J—Ju. ♄.) very smooth; leaves pinnate; leafets in many pairs, oval, abruptly acuminate, entire: panicle loose; flowers diœcious. A small tree. *S.*

toxicoden"dron, (O. g-y. J—Ju. ♄.) stem erect: leaves ternate; leafets broad-oval, entire or sinuate-dentate, sub-pubescent beneath: flowers diœcious, in sessile axillary racemes. 1—3 f. Var. *radicans*, (poison ivy) stem climbing.

Exotic.

cot'inus, (false fringe-tree, aaron's beard. p-g. Ju. ♄.) leaves simple, obovate and ovate; panicle racemes plumose. A small tree, with very minute flowers supported on capillary, downy, or hairy peduncles. Indigenous to Siberia, Austria and Lombardy.

5—1. RIBES. 36. 85.

Currant-like. Flowers racemed.

flo'ridum, (wild black currant. O. M. ♄.) unarmed: leaves punctate both sides: racemes pendant: calyx cylindric; bracts longer than the pedicels. 3—4. f. *S.*

Gooseberry-like. Peduncles mostly few-flowered, rarely sub-racemed.

triflo'rum, (wild gooseberry. A. g. M. ♄.) spine sub-axillary; leaves glabrous, 3—5-lobed, gash toothed; peduncles sub 3-flowered, with the pedicels elongated; bracts very short; petals spatulate, undulate; style hirsute, half 2 or 3-cleft, exsert: berry glabrous. Berries pale-red. 3—4 f. S.

Exotic.

rubrum, (currant. g. M. ♄.) unarmed; racemes glabrous, nodding; corolla flat; petals obcordate; leaves obtusely 5-lobed; stem erect. Berries red. 2—4 f.

nigrum, (black currant. g. M. ♄.) unarmed; leaves punctate beneath; racemes lax; flowers bell-form; bracts shorter than the pedicels. Berries black. 5—3 f.

grossula'ria, (english gooseberry, g. M. ♄.) branches prickly; petioles hairy; bracts 2-leaved; berry glabrous or hirsute. 2—4 f.

19—15. RICINUS. 38. 96.

Exotic.

commu'nis, (castor-oil plant, palma christi. ⊙.) leaves peltate, palmate; lobes lanceolate, serrate: stem with hoary mealiness. 4—6 f.

16—10. ROBINIA. 32. 93.

pseudo-aca'cia, (locust tree, false acacia. A. w. M. ♄) leaves pinnate, with a terminal leafet: stipules thorny, or a thorn; racemes pendant; teeth of the calyx unawned; legumes smooth. 30—40 f. *S.*

11—13. ROSA. 35. 93.

parvi'flora, (wild rose. O. r. w. ♄.) germs depressed-globose; germs and peduncles hispid; petioles pubescent, sub-aculeate; stem glabrous; prickles stipular, straight: leafets lance-oval, simply serrate, glabrous: flowers somewhat in pairs. Very variable. 1—3 f. *S.*

rubigino'sa, (sweet-briar. E. r. J. ♄.) germ ovate: peduncles and petioles glandular-hispid; petioles somewhat prickly: stem glabrous; prickles scattered, hooked, slender; leafets (5 or 7,) ovate, serrate, sub-glandular beneath. 3—4 f. *S.*

Exotic.

cani'na, (dog rose. ♄.) germs ovate: germs and peduncles glabrous: stem and petioles prickly: leaves ovate, glabrous.

gal''lica, (french rose, common rose. r. J. ♄.) germs ovate: germs and peduncles hispid; stem and petioles hispid-prickly. Sometimes the colours are variegated.

damasce'na, (damask rose. w. r. J. ♄.) calyx half-pinnate: germ ovate, turgid, (thickened near its top,) bristly: stem and petioles prickly: leafets ovate, pointed, downy beneath.

musco'sa, (moss rose. r. Au. ♄.) germs ovate: calyx, peduncles, petioles and branches hispid, glandular-viscid, (moss-like;) spines of the branches scattered, straight.

moscha'ta, (musk rose. ♄.) germs ovate: germs and peduncles villose; stem and petioles prickly: leafets oblong, acuminate, glabrous: panicle many-flowered.

burgundi'aca, (burgundy rose. ♄.) germs sub-globose: germs and peduncles hispid; leafets ovate, pubescent beneath: corolla small, full, fleshy-white; disk obscure. Var. *provincialis*, has scattered reflexed prickles on the branches, and glandular serratures.

semerflo'rens, (monthly rose. ♄.) germs ovate-oblong, tapering to both ends; germs and peduncles hispid; stem prickly: flowers in erect corymbs. Resembles damascena.

alba, (white rose. w. J. ♄.) germs ovate, glabrous or hispid: stem and petioles prickly; leafets ovate, villose beneath.

centifo'lia, (hundred-leaved rose. r. ♄.) germs ovate; germs and peduncles hispid; stem hispid, prickly; leaves pubescent beneath; petioles unarmed.

cinnamo'mea. (cinnamon rose. ♄.) germs globose; germs and peduncles glabrous; stem with stipular prickles; petioles somewhat unarmed; leafets oblong. R. majalis. Stem brown-cinnamon colour.

multiflo'ra, (japan rose. ♄.) germs ovate; germs and peduncles unarmed, villose; stem and petioles prickly. Branches generally purple; leafets ovate; flowers small, panicled.

2—1. ROSMARINUS. 42. 39.

Exotic.

officina'lis, (rosemary. ♄.) leaves, some green both sides; others whitish beneath, linear; margins revolute.

4—1. RUBIA. 47. 57.

Exotic.

tincto'ria, (madder.) leaves lanceolate, about in sixes; stem prickly, climbing. Var. *sylvestris*, lower leaves in sixes, upper ones in fours or in pairs.

11—13. RUBUS. 35. 92.

ide'us, (garden raspberry. E. w. M. ♄.) leaves quintate-pinnate and ternate; leafets rhomb-ovate, acuminate, downy beneath; petioles channelled; stem prickly, hispid flowers sub-panicled. Var. *americanus*, branchlets nearly glabrous; stem and petioles terete; leaves all ternate; pedicels somewhat prickly. 4—6 f. *S.*

villo'sus, (high blackberry. O. w. J. ♄.) pubescent, hispid and prickly; leaves digitate, in threes or fives; leafets ovate, acuminate, serrate, hairy both sides; stem and petioles prickly; calyx short, acuminate; racemes naked; petals lance-ovate. 4—6 f. *S.*

strigo'sus, (red raspberry. O. w. J. ♄.) unarmed, rigidly hispid; leafets 3, or pinnate-quinate, oval, at the base obtuse, acuminate, marked with lines, and white-downy beneath, terminal one often sub-cordate. Fruit red, sweet.

occidenta'lis, (black raspberry. O. w. g. ♄.) branches and petioles glaucous and prickly; leaves ternate, oval, acuminate, sub-lobate and doubly serrate, white-downy beneath; petioles terete; prickles recurved. 4—8 f. *S.*

trivia'lis, (creeping blackberry, dew-berry. O. w. J. ♄.) sarmentose-procumbent; petioles and peduncles aculeate-hispid, with the prickles recurved; stipules subulate; leaves ternate or quinate, oblong-oval, acute, unequally serrate, sub-pubescent; pedicels solitary, elongated. Var. *flagellaris*, has orbicular petals, and small smooth leaves. *S.*

odora'tus, (flowering raspberry. E. r. J. ♄.) unarmed, erect, viscid-hipsid; leaves simple, acutely 3 or 5-lobed; corymbs terminal, spreading. Flowers large; berries rather dry and thin. 3—6 f. *S.*

17—3. RUDBECKIA. 49. 55.

lacinia'ta, (cone-flower, cone-disk sunflower. O. y. Au. ♃.) lower leaves pinnate; leafets 3-lobed; upper ones ovate; egret crenate; stem glabrous. Damp. 5—10 f. *S.*

6—3. RUMEX. 12. 28.

cris"pus, (dock. O. Ju. ♃.) valves of the calyx ovate, entire, all bearing grain-like appendages on their backs; leaves lanceolate, undulate, acute. 2—3 f.

acetosel"lus, (field sorrel. O. g. p. M. ♃.) valves without grains; leaves lance-hastate; flowers dioecious. 6—12 i.

Exotic.

patien"tia, (garden dock, patience. ♃.) valves entire, one of them bearing a grain-like appendage; leaves lance-ovate. Naturalized.

10—1. RUTA. 26. 81.

Exotic.

grave'olens, (rue.) leaves more than decompound; leafets oblong, terminal ones obovate; petals entire.

3—2. SACCHARUM. 4. 10.

Exotic.

officina'rum, (sugar cane.) flowers panicled, in pairs, one sessile and one pedicelled: corolla 1-valved, awnless. From the East Indies.

19—12. SAGITTARIA. 5. 13.

sagittifo'lia (arrow head. O. w. Ju. ♃.) leaves lanceolate-acute, sagittate; lobes lanceolate, acute, straight. Var. *latifolia*, leaves ovate, sub-acute, sagittate; lobes ovate, slightly acuminate, straight. Var. *major*, leaves large, abruptly acute; scape sub-ramose. 1—2 f. *S.*

1—1. SALICORNIA. 12. 29.

herba'cea, (samphire, glasswort. L. Au. ⊙.) herbaceous, spreading: joints compressed at the apex, emarginate-bifid. Var. *virginica*, has the branches undivided, and the jointed spikes very long. The fructification is very obscure; but it may be known by its leafless nearly cylindric jointed branches. It grows in salt marshes along the sea-board. Onondaga salt springs. 12—18 i. *S.*

20—2. SALIX. 50. 99.

babylo'nica, (weeping willow. E. M. ♄.) branchlets pendant; leaves lanceolate, acuminate, serrate, glabrous, upper and lower sides of different colours; stipules roundish, contracted; aments flower at leafing time; germs sessile, ovate, glabrous. Supposed to be the willow on which the Israelites hung their harps, when captive in Babylon. Introduced. *S.*

2—1. SALVIA. 42. 39.

Exotic.

officina'lis, (sage. b. J. ♃. or ♄.) leaves lance-ovate, crenulate; whorls few-flowered; calyx mucronate.

scla'ra, (clarry. ♂.) leaves rugose, cordate, oblong, villose, serrate; floral bracts longer than the calyx, concave, acuminate.

5—3. SAMBUCUS. 43. 58.

canaden''sis, (black-berried elder. O. w. J. ♄.) branchlets and petioles glabrous; leafets about in 4 pairs, oblong-oval, glabrous, shining, acuminate; cyme lax, divided into about 5 parts. 8—15 f.

pubes''cens, (red-berried elder. O. w. M. ♄.) bark warty; leafets in 2 pairs, lance-oval, pubescent beneath: flowers raceme-panicled, or in a crowded bunch. 6—12 f.

13—1. SANGUINARIA. 27. 62.

canaden''sis, (blood-root. O. w. Ap. ♃.) leaves sub-reniform, sinuate-lobed: scape 1-flowered. A variety, *stenopetala*, has linear petals. 6—10 i. *S.*

4—2. SANGUISORBA. 54. 92.

canaden''sis, (burnet saxifrage. w. Ju. ♃.) flowers in a long cylindric spike: stamens several times longer than the corollas. The leaves resemble the burnet. 3—5 f. *S.*

5—2. SANICULA. 45. 60.

marylan''dica, (O. w. June—Au. ♃.) leaves all digitate; leafets oblong, deeply serrate; staminate flowers numerous, pedicelled. 2 f. *S.*

10—2. SAPONARIA. 22. 82.

Exotic.

officina'lis, (soapwort, bouncing bet. w. J. ♃.) calyx-cylindric; leaves lance-ovate, opposite sub-connate, entire. Probably introduced, and naturalized. 10—18 i.

12—1. SARRACENIA. 54. 62.

purpu'rea, (side-saddle. O. p. J. ♃.) leaves radical, short, gibbose-inflated or cup-form, contracted at the mouth, having a broad arched lateral wing; the contracted part of the base hardly as long as the inflated part. Scape with a single, large nodding flower. In marshes. 1—2 f. *S.*

13—1. SATUREJA. 42. 39.

horten''sis, (summer savory. b-w. Ju. ☉.) peduncles axillary, somewhat in cyme; leaves lanceolate, entire; stem brachiate.

7—4. SAURURUS. 2. 6.

cer'nuus, (lizard's tail, breast weed. W. Au. ♃.) stem angular, sulcate; leaves alternate, heart-oblong, acuminate. Rare in New-York east of Cayuga Lake—abundant west of it. 1—2 f.

10—2. SAXIFRAGA. 13. 84.

Leaves radical, undivided: stem nearly naked.

virginien''sis, (rock saxifrage. O. w. M. ♃.) minutely pubescent; leaves oval obtuse, crenate, decurrent into the petiole; flowers sub-sessile on the dichotomous branches of an almost leafless scape. 1—15 i. *S.*

pensylva'nica, (water saxifrage, O. y-g. M. J. ♃.) pubescent; leaves oblong-lanceolate, acute at each extremity, obsoletely toothed; stem naked; panicle oblong, flowers fasciculate; petals linear, longer than the calyx; capsule superior. 18—28 i.

Exotic.

sarmento'sa, (beef-steak, creeping saxifrage. w. Au. ♃.) leaves roundish, toothed, hairy; sending off creeping shoots; 2 petals in each flower elongated.

6—1. SCILLA. 10. 14.

Exotic.

marit''ima, (squill. w.) scape long, naked, many-flowered; bracts bent back. Root bulbous.

13—2. SCROPHULARIA. 40. 40.

marylan''dica, (figwort. O. g-p. Ju. ♃.) leaves cordate, serrate, acute, rounded at the base; petioles ciliate below; panicle fasciculate, loose, few-flowered; stem obtusely angled. 2—4 f. *S.*

13—1. SCUTELLARIA. 42. 39.

lateriflo'ra, (mad-dog scull-cap, hood-wort. O. b. Ju. ♃.) branching, glabrous; leaves long-petioled, ovate, toothed; cauline ones sub-cordate; racemes lateral, leafy. Damp. 1—2 f. *S.*

galericula'ta, (scull-cap. O. b. J. ♃.) branching; leaves sub-sessile, lance-ovate, sub-cordate at the base, crenate, a little white-downy beneath; flowers axillary, solitary or in pairs. Flowers large. Damp. 12—18 i.

3—2. SECALE. 4. 10.

cerea'le, (rye. J. ♂.) glumes and bristles scabrous-ciliate: corolla smooth. Introduced.

10—5. SEDUM. 13. 83.

terna'tum, (false ice-plant. W. w. J. ♃.) small, creeping: leaves flat, round-spatulate, ternate: flowers somewhat 3-spiked. Varies into the eighth class. Cultivated. *S.*

Exotic.

tele'phium, (orpine, live-forever. r. w. Ju. ♃.) leaves flattish, tooth-serrate, thickly-scattered; corymb leafy; stem erect.

anacamp''seros, (stone-crop. ♃.) leaves wedge-form, entire, sub-sessile; stem decumbent; flowers corymbed.

12—13. SEMPERVIVUM. 13. 83.

Exotic.

tecto'rum, houseleek. Au. ♃.) leaves ciliate; bulbs spreading; nectaries wedge-form, crenulate.

arbo'reum, (tree houseleek.) stem woody, smooth, branching; leaves wedge-form, glabrous, with soft spreading hairs.

15—12. SIDA. 37. 74.

abu'tilon, (indian mallows. E. y. Ju. ⊙.) leaves round-cordate, acuminate, toothed, tomentose; peduncles solitary, shorter than the petioles; capsules 2-awned, truncate. 4—6 f. *S.*

10—3. SILENE. 22. 82.

pennsylva'nica, (pink-catchfly. p. M. J. ♃.) viscidly pubescent; radical leaves wedge-form; stem leaves lanceolate; panicles trichotomous; petals slightly emarginate, very obtuse, sub-crenate. 8—12 i. *S.*

virgin''ica, (r J. ♃.) erect or decumbent; viscidly pubescent; leaves lance-oblong, scabrous on the margin; panicle dichotomous; petals bifid; stamens exsert. 12 i. *S.*

14—2. SINAPIS. 39. 63.

Exotic.

nigra, (common mustard. y. J. ⊙.) silique glabrous, 4-angled, close-pressed to the stem; leaves at the top lance-linear, entire, smooth. Naturalized.

15—3. SISYRINCHIUM. 6. 18.

anceps, (blue-eyed grass. O. b. J. ♃.) scape (or culm) simple, 2-edged or 2-winged; glume-like spatha of 2 unequal valves, extending above the flower; petals mucronate. 6—12 i. *S.*

20—6. SMILAX. 11. 12.

rotundifo'lia, (green brier. O. w-g. Ju. ♄.) stem prickly, sub-terete; leaves unarmed, roundish-ovate, short-acuminate, cordate, 5-7-nerved; berries spherical. *S.*

5—1. SOLANUM. 28. 41.

dulcama'ra, (bittersweet. E. p-b. Ju. ♄.) stem unarmed, woody, climbing; lower leaves mostly cordate, glabrous; upper ones mostly guitar-hastate, few-flowered; corymbs opposite to the leaves. This is the true bittersweet; but the Celastrus scandens is wrongly called so by some. Damp.

nigrum, (deadly night-shade. O. w. p. b. J. ⊙.) stem unarmed, erectish or erect; branches angled, dentate; leaves ovate, repand, glabrous; racemes 2-ranked, nodding. 1—2 f. *S.*

Exotic.

tubero'sum, (potato. b. w. Ju. ♄.) stem wing-angled, unarmed; leaves interruptedly pinnate; leafets entire; flowers sub-corymbed; roots knobbed-tuberous. Cultivated.

lycoper''sicum, (love apple, tomatoes. y. S. ⊙.) stem unarmed; leaves pinnatifid, gashed; racemes 2-parted, leafless; fruit glabrous, torulose.

melonge'na, egg-plant. J. ⊙.) stem unarmed; leaves ovate, tomentose; peduncles pendant, incrassate; calyx unarmed.

pseudo-cap'sicum, (jerusalem cherry. ♄.) stem woody; leaves lanceolate, repand; umbels sessile.

17—2. SOLIDAGO. 49. 55.

1. *Flowers one-sided. Leaves with three combined nerves.*

canaden''sis, (canadian golden-rod. O. y. Ju. ♃.) stem downy; leaves lanceolate, serrate, rough; racemes copious panicled, recurved; rays hardly longer than the disk; stem angular; leaves sessile, three inches long, sometimes nearly entire. 2—5 f. *S.*

gigan''tea, (giant golden-rod. O. y. Au. ♃.) stem erect, glabrous; leaves lanceolate, smooth, serrate, rough-edged, obscurely 3-nerved; racemes panicled; peduncles rough-haired; rays short. 4—7 f. *S.*

lateriflo'ra, (side-flowered golden-rod. y. Au. ♃.) stem erect, a little hairy; leaves lanceolate, slightly 3-nerved, glabrous, rough-edged; lower ones subserrate; racemes panicled, a little recurved, sub-secund; flowers large, the rays being much longer than the calyx; stem striated, often purplish, pinnatifid, with numerous lateral flowering branches. 2—3 f. *S.*

2. *Racemes or flowers one-sided. Leaves reiny.*

altis'sima, (variable golden-rod. O. y. Au. ♃.) stem erect, rough-haired; leaves lanceolate; lower ones deeply serrate, scabrous, rugose. The panicled racemes are very numerous and spread every way, so as to bring the one-sided flowers upwards; rays half as long again as the calyx. But this species is so variable that students generally endeavour to make several species of it. The serratures of the leaves are equal and unequal; it is hairy or villose; and sometimes the racemes diverge but little. 3—6 f. *S.*

pat''ula, (spread golden rod. O. y. S. ♃.) stem erect, glabrous; leaves oval, serrate, glabrous; radical ones oblong-spatulate; racemes panicled, spreading; peduncles pubescent. Stem wand-like, angular and striate; stem-leaves sessile, about an inch long, pointed; the radical ones resemble those of the ox-eyed daisy; racemes about an inch long; flowers rather large. 2 f. *S.*

3. *Racemes erect.*

bi'-color, (white golden-rod. O. w. Au. ♃.) stem hairy; leaves oval, hairy; lower ones serrate; those on the flower branches entire, numerous, and small; scales of the calyx obtuse. Racemes are short and compact; rays white, somewhat numerous and shortish; disk florets rather numerous. 2—4 f. *S.*

3—2. SORGHUM. 4. 10.

Exotic.

sacchara'tum, (broom-corn. y-g. Au. ☉.) panicle somewhat whorled, spreading; seeds oval; glumes covered with permanent softish hairs; leaves linear. From the East Indies. 6—8 f.

10—5. SPERGULA. 22. 82.

arven''sis, (spurry. w. Ju. ☉.) leaves whorled: panicles dichotomous; peduncles of the fruit becoming reflexed. 6—10 i. *S.*

20—5. SPINACIA. 12. 28.

Exotic.

olera'cea, (spinach. J. ☉.) fruit sessile, prickly or unarmed; leaves hastate-sagittate; stem branched. In habit resembles the Chenopodium album. 1—2 f.

11—5. SPIRÆA. 36. 92.

Stem more or less woody.

salicifo'lia, (meadow sweet, willow hard-hack. O. r. w. J. ♄.) leaves lance-ovate or obovate, serrate, glabrous; flowers in panicled spreading racemes. Var. *alba*, has white petals, and generally the twigs are reddish. the small branches are generally killed by frost in the winter, as also of the next species. 2—4 f. *S.*

tomento'sa, (steeple bush, purple hard-hack, meadow-sweet. O. r. Ju. ♄.) leaves lanceolate, unequally serrate, downy beneath: racemes in a crowded, sub-panicled, spike. 2—3 f. *S.*

hypericifo'lia, (john's-wort, hard-hack. w. M. ♄.) leaves obovate, entire or toothed at the apex; umbels sessile. Cultivated. 3 f.

opulifo'lia, (nine-bark, snow-ball, hard-hack. E. w. J. ♄.) leaves subovate, lobed, doubly toothed or crenate, glabrous; corymbs terminal, crowded; capsules inflated; flowers trigynious. Wet. 3—5 f. *S.*

Exotic.

ulma'ria, (queen of the meadow. w. Au. ♃.) leaves pinnate, downy beneath; the terminal leafets larger, 3-lobed; the lateral ones undivided: flowers in a proliferous corymb. Stem herbaceous.

13—1. STACHYS. 42. 39.

as'pera, (hedge nettle, clown heal. O. w-p. Ju. ♃.) stem erect, hispid backwards: leaves sub-petioled, lanceolate, acutely serrate, very glabrous; whorls about 6-flowered; calyx with spreading spines. Var. *tenuifolia*, leaves very thin and slender.

5—3. STAPHYLEA. 23. 95.

trifo'lia, (bladder nut. E. y-w. M. ♄.) leaves in threes: racemes pendant; petals ciliate below. When in flower, if the germ be cut transversely and examined, it will appear 2 or 3-celled, and will contain the rudiments of 15 to 20 seeds. But when the fruit is ripe, it consists of 2 or 3 inflated, adnate, sub-membranous capsules, each containing 1 to 3 hard small nuts. 6—12 f. *S.*

16—10. STROPHOSTYLES. 32. 93.

angulo'sa, (E. p. Au. ☉.) leaves ternate; leafets angular, 2—3-lobed: peduncles longer than the leaves; flowers capitate. *S.*

hel'vola, (r.) prostrate, sometimes twining: leaves ternate, deltoid-oblong: flowers capitate: banner short: wings large, expanded. *S.*

5—1. SYMPHITUM. 41. 42.

Exotic.

officina'le, (comfrey. y-w. J. ♃.) leaves ovate-sub-lanceolate, decurrent, rugose. Naturalized. 2—4 f.

2—1. SYRINGA. 48. 37.

vulga'ris, (lilac. b-p. w. M. ♄.) leaves cordate: flowers in a thyrse.

per''sica, (persian lilac. b. M. ♄.) leaves lanceolate, entire and pinnatifid.

17—2. TAGETES. 49. 55.

Exotic.

erec''ta, (african marygold. y. Ju. ☉.) leaves pinnate; leafets lanceolate, ciliate-serrate: peduncles 1-flowered, incrassate, sub-inflated: calyx angled.

17—2. TANACETUM. 49. 55.

Exotic.

vulga're, (tansey. y. Ju. ♃.) leaves doubly pinnate, gash-serrate. Naturalized. Var. *crispum*, (double tansey,) leaves crisped and dense.

13—1. TEUCRIUM. 42. 89.

canaden''se, (wood-sage, germander. O. r. Ju. ♃.) pubescent: leaves lance-ovate, serrate, petioled: stem erect: spikes whorled, crowded: bracts longer than the calyx. Var. *virginicum*, upper leaves sub-sessile; bracts about the length of the calyx. 1—3 f. *S.*

12—13. THALICTRUM. 26. 61.

dio'icum, (meadow rue. O. w-r. M. ♃.) flowers dioecious: filaments filiform: leaves about 3-ternate; leafets roundish, cordate, obtusely lobed, glabrous; peduncles axillary, shorter than the leaves. 1—2 f. *S.*

12—1. THEA. 54. 71.

Exotic.

bohe'a, (bohea tea. M. ♄.) flowers 6-petalled; leaves oblong-oval, rugose. From China and Japan.

vir''idis, (green tea. ♄.) flowers 9-petalled: leaves very long-oval. J. C. Lettson says this is only a variety of the bohea.

14—1. THLASPI. 39. 63.

bursa-pasto'ris, (shepherd's purse. O. w. M. ⊙.) hirsute: silicles deltoid-obcordate; radical leaves pinnatifid. *S.*

13—1. THYMUS. 42. 39.

Exotic.

vulga'ris, (thyme. b-p. J. ♃. ♄.) erect; leaves ovate and linear, revolute; flowers in a whorled spike.

12—1. TILIA. 37. 79.

gla'bra, (bass-wood, lime-tree. O. y-w. Ju. ♄.) leaves round-cordate, abruptly acuminate, sharply serrate, sub-coriaceous, glabrous; petals truncate at the apex, crenate; style about equalling the petals; nut ovate. Large tree; wood soft and white. Leaves often truncate at the base. *S.*

6—1. TRADESCANTIA. 6. 13.

virgin''ica, (spider-wort. b-p. M. ♃.) erect, branching; leaves lanceolate, elongated, glabrous; flowers sessile; umbel compact, pubescent. Cultivated. 1—2 f.

17—1. TRAGOPOGON. 49. 53.

Exotic.

porrifo'lium, (vegetable oyster, goat-beard, salsify. p. Ju. ♂.) calyx longer than the rays of the corolla; the corollets very narrow, truncate; peduncles incrassate.

13—1. TRICHOSTEMA. 42. 39.

dichot''oma, (blue curls. b. Au. ⊙.) leaves lance-ovate; branches flower-bearing, 2-forked; stamens very long, blue, curved. Var. *linearis*, somewhat pubescent; leaves linear. 6—12 i. *S.*

7—1. TRIENTALIS. 20. 34.

america'na, (chick wintergreen. O. w. Ju. ♃.) leaves lanceolate, serrulate; acuminate: petals acuminate. 3—6 i.

16—10. TRIFOLIUM. 32. 93.

re'pens, (white clover. O. w. M. ♃.) creeping: leafets ovate-oblong, emarginate, serrulate: flowers in umbelled heads: teeth of the calyx subequal: legumes 4-seeded. *S.*

praten''se, (red clover. O. r. M. ♃.) ascending, smoothish, leafet ovate, sub-entire; stipules awned: spikes dense-ovate; lower tooth of the calyx shorter than the tube of the corolla, and longer than the other teeth. 2—3 f. *S.*

arven''se, (rabbit-foot. O. w. J. ⊙.) heads very hairy, oblong-cylindrical: teeth of the calyx setaceous, longer than the corolla: leafets villose, narrow-obovate; banner deciduous. 6—12 i. *S.*

6—3. TRILLIUM. 11. 12.

pen''dulum, (nodding wake-robin. w. M. ♃.) peduncles erect, with the flower a little nodding: petals ovate, shortly acuminate, spreading, flat, longer than the calyx: leaves rhomboid-acuminate, sessile.

erec''tum, (false wake-robin. O. p. w-y. M. ♃.) peduncles erect or erectish, with the flowers a little nodding: petals ovate, acuminate, spreading; equalling the calyx; leaves rhomboid, acuminate, sessile. Var. *atropurpureum*, petals large, dark purple. Var. *album*, petals smaller, white; germ red. Var. *flavum*, petals yellow: both petals and calyx leaves longer and narrower. 12 to 18 inches high. leaves often 3 to 4 inches broad. Peduncles about 3 inches long. 9—16 i. *S.*

3—2. TRITICUM. 4. 10.

Exotic.

hyber''num, (winter wheat. J. ♂.) calyx-glume 4-flowered, tumid, even, imbricate, abrupt, with a short compressed point; stipule jagged: corollas of the upper florets somewhat bearded. There are several varieties of this species which are induced by culture.

8—1. TROPÆOLUM. 23. 73.

Exotic.

ma'jus, (nasturtion, indian cress. y. & r. Ju. ☉. & ♃.) leaves peltate, subrepand; petals obtuse, some of them fringed.

6—1. TULIPA. 10. 14.

Exotic.

suave'olens, (sweet tulip. M. ♃.) small stem 1-flowered, pubescent; flower erect; petals obtuse, glabrous; leaves lance-ovate.

gesneria'na, (common tulip. M. ♃.) stem 1-flowered, glabrous; flower various-coloured, erect; petals obtuse, glabrous; leaves lance-ovate.

17—2. TUSSILAGO. 49. 55.

far'fara, (colt's foot. y. Ap. ♃.) scape single-flowered, scaly; leaves cordate, angular, toothed downy beneath. The flower appears long before the leaves. 4—6 i.

19—3. TYPHA. 3. 8.

latifo'lia, (cat-tail, reed-mace. O. Ju. ♃.) leaves linear, flat, slightly convex beneath: staminate and pistillate aments close together. Wet 4—6 f. S.

5—2. ULMUS. 53. 99.

america'na, (elm, white-elm. O. g-p. Ap. ♄.) branches smooth: leaves oblique at the base, having acuminate serratures a little hooking: flowers pedicelled: fruit fringed with dense down. Var. *pendula*, has hanging branches and smoothish leaves. 40—70 f. S.

21—1. ULVA. 57. 2.

lin''za, frond lance-linear; margin undulate-crisped. About an inch broad, tapering to the base, green. Sea-shore.

5—2. URASPERMUM. 45. 60.

clayto'ni, (sweet cicely. O. J. ♃.) leaves compound, hairy: leafets gash-toothed; umbels axillary and terminal, about 5-rayed: style as long as the villose germ, filiform, deflected. 2 f.

21—6. UREDO. 58. 1.

linea'ris, (yellow-grain-rust. J. ☉.) linear, very long, stained-yellow, at length but obscurely coloured. On the culms and leaves of barley, oats, rye, wheat, &c.

19—4. URTICA. 53. 99.

dio'ica, (common nettle. O. J. ♃.) leaves opposite, cordate, lance-ovate, coarsely serrate: flowers diœcious; spikes panicled, glomerate, in pairs, longer than the petioles. 2—3 f. S.

21—5. USNEA. 57. 2.

plica'ta, frond pendulous, smooth, pale: branches lax, very branching, subfibrous; the extreme ones capillary: receptacles flat, broad, ciliate: the ciliæ very slender and long. On trunks and branches of trees: most common on dry dead limbs of evergreens, from which it often hangs in long green locks.

6—1. UVULARIA. 11. 14.

perfolia'ta, (bell-wort. O. y. M. ♃.) leaves perfoliate, oval obtuse, (lance-linear or oval-oblong in the young state :) corolla bell-liliaceous, scabrous or granular within : anthers cuspidate. 8—12 i.

sessilifo'lia, (O. y. M. ♃.) stem smooth ; leaves sessile, oval-lanceolate, glaucous beneath ; petals flat, smooth within : capsules stiped. 6—12 i. S.

10—1. VACCINIUM. 18. 51.

resino'sum, (black whortleberry. O. p. M. ♄.) leaves slender, petioled, oblong-oval, mostly obtuse, entire, bedewed with resinous specks beneath : racemes lateral, 1-sided : pedicels short, somewhat bracted : corolla ovate-conic, 5-cornered. Berries black. One variety has a yellowish-green, and another has a reddish-yellow corolla. 1—4 f. S.

6—3. VERATRUM. 10. 13.

vir"ide, (indian poke, white hellebore. O. J. y. ♃.) racemes paniculate ; bracts of the branches oblong-lanceolate, partial ones longer than the sub-pubescent peduncles : leaves broad-ovate, plaited. 3—4 f. S.

5—1. VERBASCUM. 28. 41.

thapsus, (mullein. O. y. J. ♂.) leaves decurrent, downy both sides : stem generally simple, though sometimes branched above : flowers in cylindric-spike. 3—6 f. S.

blatta'ria, (moth mullein, sleek mullein. w-y. J. ♄.) leaves glabrous, tooth-serrate ; lower ones oblong-obovate : upper ones heart-ovate, clasping : pedicels 1-flowered, in a terminal panicle-raceme. Var. *alba*, leaves toothed : flowers white. Var. *lutea*, leaves doubly serrate : flowers yellow. 2—3 f. S.

13—1. VERBENA. 42. 39.

hasta'ta, (vervain, simpler's joy. O. p-w. Ju. ♃.) erect, tall : leaves lanceolate, acuminate, gash-serrate : lower ones sometimes gash-hastate : spikes linear, panicled, sub-imbricate. Var. *pinnatifida*, has the leaves gash-pinnatifid, coarsely toothed. Var. *oblongifolia*, leaves lance-oblong, deeply-serrate, acute : spikes filiform, panicled. 2—5 f. S.

urticifo'lia, (nettle-leaf vervain. O. w. Ju. ♃.) erect, subpubescent : leaves oval, acute, serrate, petioled : spikes filiform, loose, axillary, terminal : flowers tetrandrous. 2—3f. S.

2—1. VERONICA. 43. 35.

officina'lis, (speedwell. b. M. ♃) spikes lateral, peduncled : leaves opposite, obovate, hairy : stem procumbent, rough-haired. 9—12 i. S.

angal"lis, (brook pimpernel. O. b. J. ♃.) racemes opposite, long, loose : leaves lanceolate, serrate : stem erect. 12—18 i. S.

beccabun"ga, (brook-lime. b. J. ♃.) racemes opposite : leaves oval, obtuse, sub-serrate, glabrous ; stem procumbent, rooting at the base. Probably a variety of the last. 9—18 i. S.

5—3. VIBURNUM. 43. 58.

pyrifo'lium, (w. J. ♄.) smooth ; leaves ovate-oblong, acute, crenate-serrate : petiole naked : cymes sub-pedunculate ; fruit oblong-ovate. 5—10 f.

lenta'go, (sheep-berry. O. w. J. ♄.) glabrous ; leaves broad-ovate, acuminate, hook-serrate ; petioles margined, undulate : cymes sessile. The branches when full grown often form a fastigiate top. Berries black, oval, and pleasant-tasted : somewhat mucilaginous. 8—15 f. S.

acerifo'lium, (maple guelder-rose, dockmackie. O. w. J. ♄.) leaves heart-ovate or 3-lobed, acuminate, sharp-serrate, pubescent beneath : cymes long-peduncled. Stem very flexible ; leaves broad and sub-membranaceous. 4—6 f. S. Leaves applied to inflamed tumours by the Indians.

Exotic.

op"ulus, (guelder rose, snow-ball. w. J. ♄.) leaves 3-lobed, sharp-toothed : petioles glandular, smooth ; flowers in compact cymes, surrounded with radiating florets. Var. *roseum*, has the whole cyme made up of radiating florets.

linus, (laurestine. r-w. ♄.) leaves ovate, entire, with tufts of hair in the axils of the veins beneath ; flowers in smooth cymes.

16—10. VICIA. 32. 93.

Exotic.

faba, (garden bean, windsor bean. w. & black. J. ☉.) stem many flowered, erect, strong ; legumes ascending, tumid, coriaceous ; leafets oval, acute, entire ; stipules sagittate, toothed at the base. From Persia.

5—1. VINCA. 30. 47.

Exotic.

minor, (periwinkle. b. Ap. ♄.) stem procumbent ; leaves lance-oval, smooth at the edges ; flowers peduncled ; teeth of the calyx lanceolate.

5—1. VIOLA. 29. 80.

1. *Stemless, or with a subterranean stem.*

(Leaves more or less reniform, always cordate, younger cucullate : proper colour of the corolla violet.)

cuculla'ta, (O. p. b. M. ♃.) glabrous : leaves cordate, somewhat acuminate, crenate-dentate ; autumnal ones largest, very exactly reniform : peduncle somewhat 4-sided, longer than the leaves : divisions of the calyx subulate, acuminate, emarginate behind or very entire : petals (as in many American species) oblique, veiny, very entire, white at the base, upper one generally naked, glabrous, lateral ones bearded, and with the upper one marked with a few blue lines. Var. *papilionacea*, petioles and peduncles longer : leaves sub-lance-ovate : beards of the lateral petals often yellow. Var. *tetragona*, peduncle strong, exactly 4-sided : petals azure colour, veinless. Var. *villosa* leaves, petals and peduncles villose. 4—8 i. *S.*

palma'ta, (O. p-b. M. ♃.) mostly villose : leaves heart-reniform, palmate-5—7-lobed ; lobes polymorphous, often narrow and gashed, middle one always larger ; sometimes villose both sides, sometimes only beneath, often glabrous, all of them very often purple beneath ; the first spring ones are ovate, entire ; petioles sub-emarginate : peduncle somewhat 4-sided, longer than the leaves : divisions of the calyx lance-ovate, ciliate, very entire behind : petals all very entire, veiny, and white at the base, upper ones narrower, smaller, sometimes villose at the base, yet often naked, glabrous : lateral ones densely bearded, and with the upper one, marked with a few blue lines. One variety has white flowers. 3—6 i. *S.*

(Leaves oblong or ovate, never reniform : younger ones cucullate.)

sagitta'ta, (E. b-p. Ap. ♃.) glabrous : leaves ciliate, oblong, not acute, sagittate-cordate, dentate, gashed at the base, (or furnished with elongated divaricate teeth): peduncle somewhat 4-sided, longer than the leaves : divisions of the calyx lanceolate, acuminate, emarginate behind : petals all very entire, veiny, white at the base ; upper one generally naked, glabrous ; lateral ones densely bearded, and with the upper one marked with a few blue lines : spur elongated behind. A variety has the leaves more or less villose. Dry.

(Leaves ovate or lanceolate : corolla white, with the lateral petals narrower.)

amœ'na, (E. w. Ap. ♃) glabrous : leaves ovate sub-acuminate, crenate, sometimes sub-villose above ; petioles long, spotted with red, peduncle somewhat 4-sided, equalling or exceeding the length of the leaves, spotted : divisions of the calyx lanceolate : petals all very entire, green at the base ; lateral ones sometimes with the base pubescent, and with the upper one marked with a few blue lines. Moist woods. Flowers odorous.

(Stemless.)

rotundifo'lia, (O. M. y. ♃.) glabrous : leaves thickish, appressed to the earth, broad-ovate or obicular, cordate, crenate : nerves pubescent beneath : sinus closed : peduncle somewhat 4-sided, as long as the leaves ; divisions of the calyx oblong, obtuse : petals sometimes emarginate : upper ones small : lateral ones somewhat bearded, and with the upper one, marked with a few yellowish-brown lines : spur very short. Woods. 1—3 i.

peda'ta, (O. M. p-b. ♃.) glabrous : leaves sometimes ciliate, variously divided, very often pedately-9-parted ; divisions linear and obtusely lanceolate, generally 3-lobed at the apex, often simply lanceolate, with the apex, 5—7-lobed, peduncle somewhat 4-sided : divisions of the calyx lanceolate, acute-ciliate, emarginate behind ; petals all white at the base, veinless, very entire, very glabrous, naked ; upper one truncate, and marked with a few very blue lines, sometimes obsolete. Var. *velutina*, has the two lower petals of a very deep violet colour, and appears like velvet. Var. *alba*, has white flowers. Dry. 3—4 i. *S.*

2. *Caulescent.*

pubes''cens, (O. y. ♃.) villose-pubescent : stem simple, erect, terete, leafless below : leaves broad-ovate, cordate, dentate , petioles short ; stipules large, ovate, dentate : peduncles 4-sided, shorter than the leaves : bracts subulate, minute : divisions of the calyx lanceolate : petals all very entire, veinless : upper one naked, glabrous ; lateral ones bearded, and with the upper one, marked with a few blue lines ; lower ones often becoming reddish outside ; spur short, gibbose, acutish ; stigma pubescent, scarcely beaked. Varies in pubescence : leaves are even found glabrous : the capsules are also glabrous or woolly. 4—12 i. rarely—4 f.

Exotic.

tri'color, (garden violet, heart's-ease, pansy. p. y. b-p. M. ♃.) stem angular, diffuse, divided : leaves oblong, deeply crenate : stipules lyrate-pinnatifid.

odora'ta, (sweet violet. b. M. ♃.) stemless : scions creeping : leaves cordate, crenate, smoothish : calyx obtuse : two lateral petals with a bearded or hairy line.

20—4. VISCUM. 43. 58.

verticilla'tum, (misseltoe. g-w. J. ♄.) branches opposite and whorled : leaves wedge-obovate, 3-nerved : spikes axillary, a little shorter than the leaves. Berries yellowish-white. On the branches of old trees. This is the golden bough of Virgil, and the sacred plant of the Druids. 1—2 f. *S.*

5—1. VITIS. 46. 72.

Remark. All the North American species of grape are polygamous or diœcious.

labrus''ca, (plum grape. w-g. J. ♄.) leaves broad-cordate, lobe angled, white downy beneath : fertile racemes small : berries (blue, flesh-colour and green) large. Var. *labruscoides*, (fox-grape,) has smaller fruit, approaching a tart taste.

vulpi'na, (frost grape. O. w-g. J. ♄.) leaves cordate, acuminate, gash-toothed, glabrous both sides : racemes lax, many flowered : berries small. Leaves very variable : but the uppermost mature leaves will agree with the description.

5—1. XYLOSTEUM. 48. 58.

cilia'tum, (fly-honey-suckle, twin berry. O. w-y. M. ♄.) berries distinct : leaves ovate and sub-cordate, margin ciliate, in the young state villose beneath : corolla a little gibbous or calcarate at the base : tube ventricose above : divisions short, acute : style exsert. 3—4 f.

3—1. XYRIS. 6. 13.

carolinia'na, (yellow-eyed grass. E. y. Au. ♃.) leaves linear, grass-like : stem or scape two edged : head-ovate-acute : scales obtuse. 9—18 i. *S.*

5—13. ZANTHORHIZA. 26. 61.

apiifo'lia, (parsley, yellowroot. p. Ap. ♄.) stem simple : leaves 3-ternate : petioles dilated and clasping at the base : racemes compound, below the leaves. 1—3 f.

21—5. ZANTHOXYLUM. 46. 94.

fraxin''eum, (prickly ash, tooth-ache bush. O. g-w. M. ♄.) prickly : leaves pinnate : leafets lance-oval, sub-entire, sessile, equal at the base : umbels axillary. 8—12 f. *S.*

19—3. ZEA. 4. 10.

Southern.

mays, (indian corn. y-g. Ju. ⊙.) leaves lance-linear, entire, keeled.

VOCABULARY,

OR

EXPLANATION OF BOTANICAL TERMS.

A.

A, in composition signifies privation, or destitute of; as, acaulis referring to a plant without a caulis or stem.

Abor'tive flower. Falling off without producing any fruit.

———stamens. Not furnished with anthers.

———pistil. Defective in some essential part.

———seed. Not becoming perfect through want of the fertilizing influence of the pollen.

Abrupt' leaf. A pinnate leaf with an odd or terminal leafet.

Acal'yces. From *a* signifying without and calyx, a flower cup; a class in an ancient method of arrangement, consisting of plants without a calyx.

Acau'les. From *a* wanting and *caulis* a stem; the 20th class in Magnolius' method, including plants without stems.

Acero'se leaf. Linear and permanent as in the pine.

Acic'ular. Needle shaped.

A'cinus. A small berry, which with many others, composes the fruit of the mulberry and raspberry; the plural is *acini.*

Acotyled'onous. From *a* without and *cotyledon* a seed lobe; plants destitute of seed lobes, and which consequently, put forth no seminal or seed leaves, as mosses and ferns.

Acu'leus. (From *acus* a needle) a prickle, or sharp point; common to the rose and raspberry. It differs from the thorn in being a prolongation of the outer bark of the plant, and unconnected with the wood. Prickles have been compared to the nails and claws of animals.

Acu'minate. Abruptly sharp pointed, having the point curved towards one edge of the leaf, resembling an awl.

Acute. More gradually sharp pointed than acuminate. An obtuse angle or any other mathematical angle, is acute in botanical language.

Adel'phous. From the Greek *adelphos* a brother or an equal; applied to plants whose stamens are united by their filaments, whether in one or two sets.

Adnate. Growing together.

Ad'versifo'liæ. From *adversus*, opposite; and folium, a leaf) plants whose leaves stand opposite to each other, on the same stem or branch. Name of the 5th class in Sauvage's *Methodus foliorum* (method of leaves,) as exemplified in the labiate flowers.

Æstiva'les. (From *æstas*, summer); plants which blossom in summer. The second divisions of Da Pas' method, with reference to the four seasons of the year, consisting of herbs which blossom in summer.

A'fora. (From *a* without and *fores* a door) having no doors or valves. The name of a class in Camellus' method, consisting of plants whose pericarp or seed vessel is not furnished with internal valves.

Aga'mous. (From *a*, without, and gamos, marriage) a term derived from the indelicate notions of the botanists of the last century, respecting the several distinctions of plants; and which, whatever analogies may actually exist between the vegetable and animal kingdoms, should be as far as possible be excluded from the science. Were it to be otherwise, the study of botany ought to be limited to the medical profession. Of all studies, that of botany should be unaccompanied by aught that might pain or disgust a delicate mind. Plants without any visible stamens or pistils are by French botanists called *agamous*.

A'ges of plants. *Ephemeral* are such as spring up, blossom and ripen their seed in a few hours or days; *annual* live a few months or one summer.
biennial, spring up one summer and die the following.
perennial, live an indefinite period.

Ag'gregate. (From *aggregare*, to assemble); many springing from the same point; this term was at first applied to compound flowers: but there is at present a sevenfold division of aggregate flowers; the *aggregate* properly so called;
compound,
umbellate,
cymose,
amentaceous,
glumose,
spadiceous.

——— *flower*, has its flower erected on peduncles or footstalks; which all have one common receptacle on the stem; they sometimes have one common calyx, and are sometimes separately furnished with a calyx.

Ai'grette. See egret.

A'la. A Latin word signifying a wing. It is sometimes used to express the angle formed by the stem with the branch or leaf. Linnæus and some others use the term *ala* as the name of a membrane, affixed to some species of seeds which serves as a wing to raise them into the air, and thus promotes their dispersion.

A'læ. The two lateral or side petals of a papilionaceous flower.

Albu'men. The farinaceous fleshy or horny substance which constitutes the chief bulk of monocotyledonous seeds; as wheat, rye, &c.

Albur'num. (From *albus*, white) the soft white substance, which, in trees, is found between the liber, or inner bark and the wood, and becoming solid in progress of time is converted into wood. From its colour and comparative softness, it has been styled the fat of trees.
It is called the *sap wood*, and is formed by a deposit of the cambium or descending sap; in one year it becomes wood; and a new layer of alburnum is again formed, by the descent of the cambium.

Al'gæ. Flags; these by Linnæus comprise the plants of the order *Hepaticae* and *Lichenes*.

Al'pine. Growing naturally on high mountains.

Alter'nate. Branches, leaves, flowers, &c. are alternate, when beginning at different distances on the stem; opposite is when they commence at the same distances, and base stands against base.

Alter'nately pinnate leaf; when the leafets are arranged alternately on each side of the common footstalk or petiole.

Alve'olate. Having cells which resemble a honey-comb.

Am'bitus. The outer rim of a frond, receptacle, &c.

A'ment. Flowers collected on chaffy scales, and arranged on a thread or slender stalk; these scales mixed with the flowers resemble the chaff in an ear of corn; in the willow and poplar, an ament supports both staminate and pistillate flowers on distinct roots. Flowers supported by an ament are generally destitute of a corolla.

Amplexicau'lis. Clasping the base of the stems.

Anal'ysis. To analyze a plant *botanically*, is to ascertain its name, by observing its organs, and comparing them with scientific descriptions of plants.

Ancip'etal. Having two sharp edges like a sword.

An'dria. Signifies stamen.

Androg'ynous plants. Such as bear staminate and pistillate flowers on the same root; as the oak and Indian corn; such plants belong to the class monoecia.

Angiocar'pus. Fungi bearing seeds internally.

Angiosper'mal. (From angio a vessel, and sperma seed,) plants whose seeds are inclosed or covered.

Angular. Forming angles; when the

stems, calyxes, capsules, &c. have ridges running lengthwise.

Angustifo'lius. Narrow-leaved.

An'nual. A plant which lives but one year. The herbage is often annual while the root is perennial; in this case the plant is said to be perennial.

Annula'ted. Having a ring round the capsules; as in ferns; or in mushrooms having a ringed stipe.

An'nulus. A ring.

Anom'alous. (From *a*, without, and nomos, law) irregular, or whatever forms an exception to a general rule. The 11th class in Tournefort's method is called *anomalæ*, including plants whose corollas are composed of irregular and dissimilar parts; as, the columbine, monk's hood, violet, larkspur, &c.

Anther. (From *anthos*, a flower, so called as indicating its importance) that part of the stamen which contains the pollen; it is of various forms; as linear, awl-shaped, heart-shaped, round, &c; it is one celled, two celled, &c; the anther of the Tritilaria (crown-imperial) has four cells.

Antherid'ium. A mass of pollen.

Antherif'erous. Flowers bearing anthers without filaments.

Anthus. (From the Greek *anthos*), a flower generally referring to the petals only.

Antiscorbu'tics. Substances which cure eruptions.

Apet'alous. (From a, without and *petalum*, a petal) having no petals, or corollas; such flowers are termed *incomplete*, such as are destitute of either stamens or pistils are called *imperfect.*

Apet'alæ. A class formed by some of the ancient botanists including plants destitute of corollas.

A'pex. The top or summit.

Aphyl'lous. (From *a*, without and phyllon, a leaf) destitute of leaves.

Aphyl'lae is the name given by an ancient botanist to a class of plants without leaves; comprising garlic, rush, mushrooms, &c.

Appen'daged. Having bracts, thorns, prickles, &c.

Appres'sed. Closely pressed; as leaves against the stem, &c.

Approx'imate. Growing near each other.

Ap'terous. Without wings.

Aquat'ic. (From *aqua*, water); growing in, or near water. *Aquaticæ*, was an ancient name for a class including all plants which grow in water.

Ar'bor. A tree: a perennial plant, which rises to a great height, having a woody stem. Most trees spring from seeds having two cotyledons: they are therefore called dicotyledonous plants. The stems of such plants are said to be *exogenous*, that is, growing externally, new layers of wood being every year formed under the bark, around the outside of the old wood. Palm trees are Monocotyledonous plants; their stems are called endogenous: that is, growing internally and pressing upon the outer coats which become hard and compact. The ancient botanists divided plants into trees and herbs: but this distinction is too vague to form the basis of classification.

Arbo'reus. Like a tree.

Arbusti'vus, (from arbustum, a shrub) An ancient class of plants containing shrubs, as the myrtle, mock-orange, (philadelphus,) &c.

Arch'ed. Curving above, vaulted.

Ar'cuate, (from arcus, a bow.) Bent like a bow.

Arena'rius. Growing in sand.

Argen'teus. Silver coloured.

Ar'id. Dry.

A'ril (arillus). The external coat or covering of seeds which, drying, falls off spontaneously.

Aris'tate, (from areo, to be dried). awned, ending in a bristle.

Aro'ides. So called from arum, and forming a natural family of plants.

Arms (arma). offensive weapons. Plants are said to be armed, when they are furnished with prickles, thorns, &c.

Aromat'ic. Sweet scented.

Aromat'icae. The name of a class of Dioscorides, Clusius, Bauhin and some other botanists who have arranged plants according to their virtues and sensible qualities.

Ar'row-form. Shaped like an arrow head, the hind lobes acute.

Artic'ulated. Jointed; as in culm or stem of the grasses.

Arundina'ceous, from *arundo*, a reed: resembling reeds.

Arven'sis. Growing in cultivated fields.

Ascen'ding. Rising from the ground obliquely.

Asperifo'lius. Rough leaved.

Astrin'gents. Substances which condense the fibres.

Atten'uated. Gradually diminished or tapering.

Auric'ulate. Having appendages resembling ears.

Awl-form. Sharp at the point, and curved to one side.

Awn. A short stiff bristle.

Ax'il. The angle between a leaf and stem on the upper side.

Ax'illary. Growing out of the axils: leaves are said to be axillary when they proceed from the angle formed by the stem and branch.

B.

Bac'ca. A berry. It is a pulpy pericarp, enclosing seeds without capsules. A berry is said to be proper when it is formed of the pericarp or seed vessel, improper or singular when it is formed of any other parts. In the mulberry and rose, a large, fleshy and succulent calyx becomes a berry. In the strawberry, a berry is formed of the common receptacle; in the raspberry of a seed.

Baccif'erus. Bearing berries.

Ban'ner. The upper petal in a papilionaceous flower.

Barb. A straight process armed with teeth pointing backwards.

Barba'tus. Bearded.

Bark. The covering of vegetables, consisting of several parts: as cuticle, cellular integument, &c. The bark consists of as many layers, as the tree on which it grows has years: a new layer being formed from the cambium every year. The newest layer of bark is called liber.

Bar'ren. Producing no fruit: containing stamens only.

Beak'ed. Terminating by a process shaped like the beak of a bird.

Ber'ry. A pulpy pericarp enclosing seeds without capsules. See Bacca.

Bi, derived from bis, signifying two.

Bicor'nis. Anthers with two horns.

Bi'dens. Having two teeth.

Bien'nial. Living two years, in the second of which the flower and fruit is produced: as in wheat.

Bi'fid. Two parted.

Bila'biate. Corolla with two lips.

Bipin'nate. Twice pinnate.

Biter'nate. Twice ternate. The petiole supporting three ternate leaves.

Bi'valve. Two valved.

Blas'teme. from the Greek blastema, a bud.

Bor'der. The brim or spreading part of a corolla.

Bot'rus. A cluster, like grapes.

Brach'iate. Branches opposite, and each pair at right angles with the preceding.

Bract. Floral leaf, a leaf near the flower which is different from the other leaves of the plant. In the crown-imperial the bracts are at the termination of the flower stem: from their resemblance to a hair, they are called coma.

Branch. A division of the main stem or main root.

Branch'let. Subdivision of a branch, a twig.

Bre'vis. Short.

Bruma'les, (from bruma, winter): plants which blossom in winter.

Bud. The residence of the infant leaf and flower.

Bulbs. Called roots, sometimes found growing on the stem; strictly speaking bulbs are buds, or the winter residence of the future plants. A bulb contains in miniature or embryo, a plant similar to the parent plant. Plants may be renewed from bulbs as well as seeds. Annual plants do not have bulbs; they are only preserved by seeds.

Bun'dle. See fascicle.

C.

Cadu'cous, (from cado, to fall); Falling early; as the calyx of the poppy.

Caes'pitose. Forming turfs, several roots growing together.

Cal'amus. Reed like.

Calca'reous. Containing lime, applied to shells of oysters, &c.

Calyb'ion, (from Kalubion, a little cabin): a genus in Mirbel's second class of fruits.

Calyc'ulated. Having an additional calyx.

Calyp'tra. The cap or hood of pistillate mosses, resembling an extinguisher set on a candle. Although called a calyx, it is in reality the corolla of the moss closed.

Calyx. From the Greek, signifying a *flower cup*; in most plants it incloses, and supports the bottom of the corolla. It is defined by Linnæus to be the termination of the outer bark.

Cam'bium. The descending sap, which every year forms a new layer of bark and one of wood. It descends between the bark and the wood, so that the new wood is formed externally and the new bark internally.

Campan'ulate. Bell-form.

Campes'tris. Growing in uncultivated fields.

Canes'cent. White or hoary.

Cap'illary. Hair-form.

Cap'itate. Growing in heads.

Cap'sule. A little chest; that kind of hollow seed vessel which becomes dry and opens when ripe; a capsule that never opens is called a *samara.*

Carcer'ular. (From *carcer*, prison.) a seed contained in a covering, whose sides are compressed. One of Mirbel's genera of fruits, in the order Carcerulaires.

Cari'na. The keel or lower folded petal of a papilionaceous flower.

Car'inated. Keeled, having a sharp back like the keel of a vessel.

Carno'se. Of a fleshy consistence.

Carpos. From the Greek *karpos* fruit.

Caryophyl'leous. Pink-like corolla, having five petals with long claws, all regular and set in a tubular calyx.

Cat'kin. See Ament.

Cau'date. Having a tail; as in some seeds.

Cau'dex. The main body of a tree, or root.

Caules'cent. Having a stem exclusive of the peduncle or scape.

Cau'line. Growing on the main stem.

Cau'lis. The main herbage-bearing stem of all plants, called in French, *la tige.*

Cell. The hollow part of a pericarp or anther; each cavity in a pericarp that contains one or more seeds is called a cell. According to the number of these cells the pericarp is one-celled, two-celled, three-celled, &c.

Cel'lular. Made up of little cells or cavities.

Ceno'bion. From the Greek, signifying a community; one of Mirbel's genera of fruits.

Cerion. A carcerulate fruit, forming one of Mirbel's genera of fruits.

Cerea'lis. Any grain from which bread is made. (From Ceres, goddess of corn.)

Cer'nuus. When the top only droops.

Chaf'fy. Made up of short membranous portions like chaff.

Chan'nelled. Hollowed out longitudinally, with a rounded groove.

Cho'rion. a clear limpid liquor contained in a seed at the time of flowering. After the pollen is received, this liquor becomes a perfect embryo of a new plant.

Cic'atrice. The mark or natural scar from whence the leaf has fallen.

Cil'iate. Fringed with parallel hairs.

Cine'reous. Ash coloured.

Cin'gens. Surrounding, girding around.

Cir'rose. Bearing a tendril. From Cir'rus, a tendril or climber.

Clasp'ing. Surrounding the stem with the base of the leaf.

Class. The highest division of plants in the system of Botany. Linnæus divided all plants into 24 classes; 3 of these are now rejected, and the plants which they included placed in the remaining 21 classes. The ancient botanists knew neither, methods, systems, or classes; they described under chapters, or sections, those plants which appeared to them to resemble each other in the greatest number of relations.

Cla'vate. Club-shaped, larger at the top than the bottom.

Clau'sus. Closed, shut up.

Claw. The narrow part by which a petal is inserted.

Cleft. Split or divided less than half way.

Climb'ing. Ascending by means of tendrils, as grapes; by leaf stalks, as the Clematis: by cauline radicles or little fibrous roots, as the creeping American ivy.

Club-shaped. See clavate.

Clus'tered. See racemed.

Cly'peate. Form of a buckler. See peltate.

Coad'nate. United at the base.

Coat'ed. With surrounding coats or layers.

Coccin'eous. Scarlet coloured.

Coch'leate. Coiled spirally, like a snail shell.

Coc'cum. A grain or seed; tricoccous, 3-seeded; &c.

Cœru'leus. Blue.

Coleop'tile. From koleos, an envelope, and ptilon a bud.

Co'leorrhize. From koleos, an envelope, and riza, a root.

Colli'nus. Growing on hills.

Col'oured. Different from green; in the language of botany, green in the vegetable is not called a colour. White, which in reality is not a colour, is so called in botany. The primitive colours and their intermediate shades and gradations, are by botanists arranged as follows;

Water-colour,	hyalinus.
White,	albus.
Lead-colour,	cinereus.

BLACK,	niger.
Brown,	fuscus.
Pitch-black,	ater.

YELLOW,	luteus.
Straw-colour,	flavus.
Flame-colour,	fulvus.

RED,	rubex.
Flesh-colour,	incarnatus.
Scarlet,	coccineus.

PURPLE,	purpureus.
Violet-colour,	cæruleo-purpureus.

BLUE,	cæruleus.
GREEN,	viridis.

White is most common in roots, sweet berries and the petals of spring flowers. Black, in roots and seeds. Yellow, in anthers, and the petals of compound flowers. Red, in the petals of summer flowers and acid fruits. Blue and violet colour, in the petals. Green, in the leaves and calyx.

Columel'la. That which connects the seeds to the inside of the pericarp. The central pillar in a capsule.

Column. The style of gynandrons plants; used for columella.

Co'ma. A tuft of bracts on the top of a spike of flowers.

Com'mon. Any part is common, which includes or sustains several parts similar among themselves.

Com'pound. Made up of similar simple parts.

———flowers. Such as are in the class Syngenesia, having florets with united anthers.

———leaf. When several leafets grow on one petiole.

———raceme. When several racemes grow along the side of a peduncle.

———umbel. Having the peduncles subdivided into peduncles of lesser umbels.

———petiole. A divided leaf stalk.

———peduncle. A divided flower stalk.

Compres'sed. Flattened.

Con'cave. Hollowed on one side.

Conceptac'ulum. Single valved capsule.

Conchol'ogy. The science which treats of shells.

Cone. A scaly fruit like that of the pine. See Strobilum.

Conglom'erate. Crowded together.

Con'ic. With a broad base, gradually narrowing to the top, like a sugar loaf.

Conif'erous. Bearing cones.

Con'jugate. In pairs.

Con'nate. Opposite, with the bases united or growing into one, forming the appearance of one leaf. Anthers are sometimes connate.

Conni'vent. Converging, the ends inclining towards each other.

Contin'uous. Uninterrupted.

Contor'ted. Twisted.

Contrac'ted. Close, narrow.

Conver'ging. Approaching, or bending towards each other.

Con'vex. Swelling out in a roundish form.

Con'volute. Rolled into a cylindric form, as leaves in the bud.

Cor'culum, or *Corcle.* The embryo or miniature of the future plant, which is found in seeds often between the cotyledons.

Cor'date. Heart-shaped, side lobes rounded.

Coria'ceous. Resembling leather;—thick and parchment-like.

Cor'nu. A horn or spur.

Cornic'ulate. Horn shaped.

Corol'la, or *corol.* (A word derived from *corona*, a crown.) Usually encloses the stamens.

Corona'tus. Crowned; as the thistle seed is crowned with down.

Cor'tex. (From *corium*, leather, or hide, and *tego*, to cover.) The rind, or coarse outer bark of plants; the organization of the outer and inner barks differs chiefly in the fineness of their texture.

Cor'tical. Belonging to the bark.

Coryda'lis. Helmet like.

Co'rymb. Inflorescence, in which the flower stalks spring from different heights on the common stem, forming a flat top.

Costate. Ribbed.

Cotyl'edons, (from *kotule*, a cavity.) Seed lobes. The fleshy part of seeds which in most plants rises out of the ground and forms the first leaves, called seminal or seed leaves. These lobes in the greatest proportion of plants, are two in number; they are very conspicuous in the leguminous seeds; as beans, peas, &c. The cotyledons are externally convex, internally flat, and inclose the embryo or principle of life, which it is their office to protect and nourish.

Cre'mocarpe, (from kremao, to suspend, and karpos, fruit,) a name given by Mirbel to a genus of fruits.

Creeping. Running horizontally; stems are sometimes creeping, as also roots.

Cre'nate. Scolloped, notches on the margin of a leaf which do not point towards either the apex or base.

Cre'nulate. Finely crenate.

Cres'cent-form. Resembling a half-moon.

Crest'ed. Having an appearance like a cock's comb.

Crini'tus. Long haired.

Crowded. Clustered together.

Crowned. See Coronatus.

Cru'ciform. (From crux, crucis, a cross.) Four petals placed like a cross.

Crusta'ceous. Small crusty substances lying one upon another.

Cryptoga'mia. Stamens and pistils concealed.

Cu'bit. A measure from the elbow to the end of the middle finger.

Cucul'late. Hooded or cowled, rolled or folded in, as in the spatha of the Arum or wild turnip.

Cucurbita'ceous. Resembling gourds or melons.

Cu'linary. Suitable for preparations of food.

Culm or *straw*, from the Greek kalama, stubble or straw; in Latin culmus. The stem of grasses, Indian corn, sugar cane, &c.

Culmif'erous. Having culms; as wheat, grasses, &c.

Cune'iform. Wedge-form, with the stalk attached to the point.

Cup'ula. A cup.

Curv'ed. Bent inwards. See incurved.

Cus'pidate. Having a sharp straight point. (The eye tooth is cuspidate.)

Cu'ticle. The outside skin of a plant, commonly thin, resembling the scarf or outer skin of animals. It is considered as forming a part of the bark.

Cya'neus. Blue.

Cy'athiform. Shaped like a common wine glass.

Cylin'drical. A circular shaft of nearly equal dimensions throughout its extent.

Cyme. Flower stalks arising from a common centre, afterwards variously subdivided.

Cymo'se. Inflórescence in cymes.

Cyp'sele, (from the Greek, kupselion.) A little chest.

D.

De'bilis. Weak, feeble.

Decan'drous. Plants with ten stamens in each flower.

Decaphyl'lus. Ten leaved.

Decid'uous. Falling off in the usual season; opposed to *persistent* and *evergreen*, more durable than *caducous.*

Decli'ned. Curved downwards.

Decomposi'tion. Separation of the chemical elements of bodies.

Decom'pound. Twice compound, composed of compound parts.

Decompos'itae. Name of an ancient class of plants, having leaves twice compound; that is, a common footstalk supporting a number of lesser leaves, each of which is compounded.

Decum'bent. Leaning upon the ground, the base being erect.—This term is applied to stems, stamens, &c.

Decur'rent. When the edges of a leaf run down the stem or stalk.

Decur'sive. Decurrently.

Decus'sated. In pairs, crossing each other.

Deflec'ted. Bent off.

Defolia'tion. Shedding leaves in the proper season.

Dehis'cent. Gaping, or opening.—Most capsules when ripe are dehiscent.

Del'toid. Nearly triangular, or diamond form, as in the leaves of the Lombardy poplar.

Demer'sus. Under water.

Dense. Close, compact.

Den'tate. Toothed; edged with sharp projections: larger than serrate.

Dentic'ulate. Minutely toothed.

Denu'date. Plants whose flowers appear before the leaves; appearing naked.

Deor'sum. Downwards.

Depres'sed. Flattened, or pressed in at the top.

Desrip'tions. In giving a complete description of a plant, the order of nature is to begin with the root, proceed to the stem, branches, leaves, appendages, and lastly to the organs which compose the flower, and the manner of inflorescence. Colour and size are circumstances, least to be regarded in descriptions; but stipules, bracts, and glandular hairs are all of importance.

Dextror'sum. Twining from left to right, as the hop vine.

Diadel'phous. (From dis two, and adelphia brotherhood,) two brotherhoods. Stamens united in two parcels or sets; flowers mostly papilionaceous; fruit leguminous.

Di'amond form. See deltoid.

Dianthe'ria. (from dis two, and anther; a class of plants including all such as have two anthers.

Dichot'omous. Forked, dividing into two equal branches.

Diclin'ia. Stamens in one flower, and pistils in another; whether on the same plant or on different plants.

Dicoc'cous. Containing two grains or seeds.

Dicotyled'onous. With two cotyledons or seed lobes.

Did'ymous. Twinned, or double.

Didyna'mia. From dis, twice and dunamis, power; two powers. A name appropriate to one of the Linnean classes.

Dierisil'ia. From diairesis division; one of Jussieu's orders of fruits.

Difform. A monopetalous corolla whose tube widens above gradually, and is divided into unequal parts; any distorted part of the plant.

Diffrac'ted. Twice bent.

Diffu'sed. Spreading.

Dig'itate. Like fingers. When one petiole sends off several leafets from a single point at its extremity.

Digyn'ia. Having two pistils.

Dimid'iate. Halved.

Diœ'cious. Having staminate and pistillate flowers on different plants.

Dis'coid. Resembling a disk, without rays.

Disk. The whole surface of a leaf, or of the top of a compound flower, as opposed to its rays.

Disper'mus. Containing two seeds.

Dissep'iment. The partition of a capsule.

Dissil'iens. A pericarp, bursting with elasticity; as the impatiens.

Di'stichus. Growing in two opposite ranks or rows.

Divar'icate. Diverging so as to turn backwards.

Diver'ging. Spreading. Separating widely

Diur'nus. Enduring but a day.

Dor'sal. Belonging to the back.

Dotted. See punctate and perforated.

Droop'ing. Inclining downward, more than nodding.

Drupe. A fleshy pericarp enclosing a stone or nut.

Drupa'ceous. Resembling, or bearing drupes.

Dul'cis. Sweet.

Dumo'sus. Bushy.

Du'plex. Double.

E.

Eared. Applied to the lobes of a heart-form leaf, to the side lobes near the base of some leaves, and to twisted parts in plants which are supposed to resemble the passage into the ear.

Ebur'neus. Ivory white.

Echi'nate. Beset with prickles, as a hedge-hog.

Ecos'tate. Without nerves or ribs.

Efflorescen'tia. (From effloresco, to bloom) a term expressive of the precise time of the year, and the month in which every plant blossoms. The term *efflorescence* is applied to the powdering substance found on Lichens.

Effolia'tion. Premature falling off of leaves, by means of diseases or some accidental causes.

Effuse. Having an opening by which seeds or liquids may be poured out.

Egg-form. See Ovate.

E'gret or *Ai'grette.* The feathery or hairy crown of seeds, as the down of thistles and dandelions. It includes whatever remains on the top of the seed after the corolla is removed.

——— stiped. When it is supported on a foot stem.

——— simple. When it consists of a bundle of simple hairs.

——— plumose. When each hair has other little hairs arranged along its sides.

Ellip'tic. Oval.

Elon'gated. Exceeding a common length.

Emar'ginate. Having a notch at the end, retuse.

Em'bryo. From embrao to bud forth, the germ of a plant; called by Linnæus the corculum.

En'docarp. The inside skin of a pericarp.

Endog'enous. Applied to stems which grow from the centre outwardly, as in monocotyledons.

Eno'dis. Without joints or knots.

En'siform. Sword form, two edged, as in the flag and iris.

Entire. Even and whole at the edge.

Entomol'ogy. The science of insects.

Epi. A Greek word signifying upon; often used in composition.

Ep'icarp. From epi, upon and karpos fruit, the outer skin of the pericarp.

Epider'mis. (From epi upon and derma,) skin. See Cuticle.

Epig'ynous. From epi upon and gynia, pistil.

Ep'isperm. From epi, upon and sperma seed.

Equinoc'tial flowers. Opening at stated hours each day.

E'quitant. Opposite leaves alternately enclosing the edges of each other.

Erect'. Straight; less unbending than strictus.

Ero'ded. Appearing as if gnawed at the edge.

Es'culent. Eatable.

Ev'ergreen. Remaining green through the year, not deciduous.

Excava'tus. Hollowed out.

Exot'ic. Plants that are brought from foreign countries.

Expan'ded. Spread.

Expec'torant. From expectoro, to discharge from the breast, medicines which promote a discharge from the lungs.

Exser'ted. Projecting out of the flower or sheath.

Eye. See Hilum.

F.

Facti'tious. Not natural, produced by art, (from Facio, to make.)

Fam'iles. A term in Botany implying a natural union of several genera into groups; sometimes used as synonymous with Natural Orders.

Fal'cate. Sickle shaped. Linear and crooked.

Fari'na. (From far, corn.) Meal or flour. A term given to the glutinous parts of wheat and other seeds which is obtained by grinding and sifting. It consists of gluten, starch and mucilage. The pollen is also called farina.

Fas'cicle. A bundle.

Fascic'ulate. Collected in bundles.

Fastig'iate. Flat topped.

Favo'sus. Resembling a honey comb.

Faux. Jaws. The throat of the corolla.

Feb'rifuge. (From febris, a fever and fugo to drive away.) That which possesses the property of abating fever.

Ferns. Cryptogamous plants, with the fruit on the backs of the leaves, or in spikes made up of minute capsules opening transversely.

Fer'tile. Pistillate, yielding fruit.

Fi'bre. Any thread like part.

Fil'ament. The slender thread-like part of the stamen.

Fil'ices. (From filum a thread,) Ferns.

Fil'iform. Very slender.

Fim'briate. Divided at the edge like fringe.

Fis'tulous. Hollow or tubular, as the leaf of the onion.

Flac'cid. Too limber to support its own weight.

Flagel'tiform. Like a whip lash.

Flam'meus. Flame coloured.

Fla'vus. Yellow.

Flesh'y. Thick and pulpy.

Flex'uous. Serpentine, or bending in a zig-zag form.

Flo'ra. Considered by the heathens as the goddess of flowers: descriptions of flowers are often called Floras.

Flo'ral leaf. See Bract.

Flo'ret. Little flower, part of a compound flower.

Flo'rist. One who cultivates flowers.

Flos'cular. A tubular floret.

Flow'er. (Flos.) A term which was formerly applied almost exclusively to the petals. At present a stamen and pistil only are considered as forming a perfect flower.

Flow'er stalk. See peduncle.

Folia'ceous. Leafy.

Fol'licles. Leafets; a diminutive of folium, a leaf. The smaller leaves which constitute a compound leaf.

Fo'lium. Leaf. Leaves are fibrous and cellular processes of the plants of different figures but generally extended into a membranaceous or skinny substance.

Fol'licle. A seed vessel which opens lengthwise, or on one side only.

Foot'-stalk. Sometimes used instead of Peduncle and Petiole.

Fork'ed. See Dichotomous.

Frag'ilis. Breaking easily, and not bending.

Frond. The leaf of Cryptogamous plants; formerly applied to palms.

Frondes'cence. (From frons a leaf.) The time in which each species of plants unfolds its first leaves. See Frondose.

Frondo'se. (Frondosus.) Leafy, or leaf-like.

Fructifica'tion. The flower and fruit with their parts.

Fructif'erous. Bearing or becoming fruit.

Fruc'tus. The fruit is an annual part of the plant which adheres to the flower and succeeds it; and after attaining maturity, detaches itself from the parent plant, and on being placed in the bosom of the earth gives birth to a new vegetable. In common language the fruit includes both the pericarp and the seed, but strictly speaking, the latter only is the fruit, while the former is but the case or vessel which contains it.

Frutes'cent. Becoming shrubby.

Fru'tex. A shrub.

Fu'gax. Fugacious, flying off.

Ful'cra. Props, supports; as the petiole, peduncle, &c.

Ful'vous. Yellowish.

Fun'gi. The plural of Fungus, a mushroom.

Fun'gous. Growing rapidly, with a soft texture like the fungi.

Fun'nel-form. Tubular at the bottom and gradually expanded at the top.

Fu'siform. Spindle shaped, a root thick at the top and tapering downwards.

G.

Ga'lea. A helmet.

Gem'ma. A bud containing a plant seated upon the stem and branches, and covered with scales, in order to defend it from injury. The bud resembles the seed in containing the future plant in embryo; but this embryo is destitute of a radicle, though if the bud is planted in the earth, a radicle is developed.

Gemma'ceous. Belonging to a bud. Made of the scales of a bud.

Gener'ic name. The name of a genus.

Genic'ulate. Bent like a knee.

Ge'nus. (The plural of genus is genera,) a family of plants agreeing in their flower and fruit. Plants of the same genus are thought to possess similar medical powers.

Germ. The lower part of the pistil which afterwards becomes the fruit.

Germina'tion. The swelling of a seed, and the unfolding of its embryo.

Gib'bous. Swelled out commonly on one side.

Glabel'lous. Bald, without covering.

Gla'brous. Sleek, without hairiness.

Gland. A small appendage, which seems to perform some office of secretion or exhalation.

Gland'ular. Having hairs tipped with little heads or glands.

Glauc'ous. Sea green, mealy, and easily rubbed off.

Glome. A roundish head of flowers.

Glom'erate. Many branchlets terminated by little heads.

Glume. The scales or chaff of grasses, composing the calyx and corolla, the lower ones are called the calyx, all others the corolla; each scale, chaff, or husk, is called a valve: if there is but one, the flower is called univalve, if two, bivalve.

Glu'tinous. Viscid, adhesive.

Gon. (From gonu. a knee or angle;) as pentagon, five angled; hexagon, six angled; polygon, many angled.

Graft'ing. Is the process of uniting the branches or buds of two or more separate trees. The bud or branch of one tree, is inserted into the bark of another, and the tree which is thus engrafted upon is called the stock.

Gram'ina. Grasses and grass-like plants. Mostly found in the class Triandria.

Gramin'eous. Grass like; such plants are also called culmiferous.

Grand'iflorus. Having large flowers.

Gran'ular. Formed of grains, or covered with grains.

Grave'olens. Having a strong odour.

Grega'rious. In flocks, plants growing together in groups.

Groov'ed. Marked with deep lines.

Gymnocarp'es. (from gumnos, naked and karpos fruit.) Mirbel's first class of fruits, containing such as have fruit without being covered or concealed.

Gymnosper'mia. (From gumnos, naked, and sperma, seed.) Having naked seeds.

Gynan'drous. Stamens growing upon the pistil.

Gyn'ia. From the Greek, signifying pistil.

H.

Habita'tio, or *Habitat.* The native situation of plants.

Habit. The external appearance of a plant, by which it is known at first sight, without regard to botanical distinctions.

Hair. See Pilus.

Hair'-like. See Capillary.

Hal'bert-form. See Hastate.

Hand'-form. See Palmate.

Hang'ing. See pendant.

Has'tate. Shaped like a halbert; it differs from arrow-shaped in having the side processes more distinct and divergent.

Head. A dense collection of flowers, nearly sessile.

Heart. See Corculum and Corcle.

Heart'-form. See Cordate.

Hel'met. The concave upper lip of a labiate flower.

Helminthol'ogy. The science of worms.

Hepat'ic. Liver like.

Herb. A plant which has not a woody stem.

Herba'ceous. Not woody.

Her'bage. Every part of a plant except the root and fructification.

Herba'rium. A collection of dried plants.

Herb'ist. One who collects and sells plants.

Hexag'onal. Six cornered.

Hi'ans. Gaping.

Hi'lum. The scar or mark on a seed at the place of attachment of the seed to the seed vessel.

Hir'sute. Rough with hairs.

His'pid. Bristly, more than hirsute.

Ho'ary. Whitish coloured, having a scaly mealiness, not unlike glaucous.

Holera'ceous. Suitable for culinary purposes. The term is derived from *holus*, signifying pot herbs. One of the natural orders of Linnæus called *Holeraceæ*, includes such plants as are used for the table, or in the economy of domestic affairs.

Hon'eycup. See nectary.

Hood'ed. See cucullate, or cowled.

Hora'rius. Continuing but an hour.

Horizon'tal. Parallel to the horizon.

Horn. See spur.

Hu'milis. Low, humble.

Husk. The larger kind of glume, as the husks of Indian corn.

Hyberna'lis. Growing in winter.

Hy'brid. A vegetable produced by the mixture of two species; the seeds of hybrids are not fertile.

Hy'po. From *upo*, under; much used in the composition of scientific terms.

Hypocrater'iform. Sålver shaped, with a tube abruptly expanded into a flat border.

Hypog'ynous. Under the style.

I.

Icthyol'ogy. The science of fishes.

Icosan'drous. Having about twenty stamens growing on the calyx. Such plants furnish a great proportion of the most delicious pulpy fruits.

Im'bricate. Lying over, likes scales, or the shingles of a roof.

Imper'fect. Wanting the stamen or pistil.

Incarna'tus. Flesh coloured.

Inci'sor. Fore tooth.

Inclu'ded. Wholly received, or contained in a cavity: the opposite of exsert.

Incomple'te. Flowers destitute of a calyx or corolla are said to be incomplete. A term differing from imperfect.

Incras'sate. Thickened upward, larger towards the end.

In'crement. The quantity of increase.

Incum'bent. Leaning upon or against.

Incur'ved. Bent inwards.

Indig'enous. Native, growing wild in a country, (some exotics after a time, spread and appear as if indigenous.)

In'durated. Becoming hard.

Indu'sium. A covering, plural indusia.

Infe'rior. Below; a calyx or corolla is inferior when it comes out below the germ.

Infla'ted. Appearing as if blown out with wind, hollow.

Inflex'ed. The same as incurved.

Inflores'cence. (From *infloresco*, to flourish). The manner in which flowers are connected to the plant by the peduncle, as in the whorl, raceme, &c.

Infrac'tus. Bent in with such an acute angle as to appear broken.

Infundibulifor'mis. Funnel form.

Inser'ted. Growing out of, or fixed upon.

Insi'dens. Sitting upon.

Insigni'tus. Marked.

In'teger. Entire.

Interno'de. The space between joints; as in grasses.

Interruptedly-pin'nate. When smaller leafets are interposed among the principal ones.

Intor'tus. Twisted inwards.

Introdu'ced. Not originally native. Brought from some other country.

Involu'crum. A kind of general calyx serving for many flowers, generally situated at the base of an umbel or head.

Involu'cel. A partial involucrum.

In'volute. Rolled inwards.

Irides'cent. Reflecting light, (from Iris the rainbow.)

Irreg'ular. Differing in figure, size or proportion of parts among themselves.

Irritabil'ity. The power of being excited so as to produce contraction; this power belongs to vegetables as well as animals: sensation is thought to imply the existence of internal properties not possessed by plants; though some have attributed sensation to plants, as well as animals.

J.

Jag'ged. Irregularly divided and subdivided.

Jaws. See faux.

Joints. Knots, or rings in culms, pods, leaves, &c.

Ju'gum. A yoke; growing in pairs.

Juxta-position. (From *juxta* near and *pono* to place) nearness of place.

K.

Keel. The under lip of a papilionaceous flower.

Keel'ed. Shaped like the keel of a boat or ship.

Ker'nel. See Nucleus.

Kid'ney-shaped. Heart shaped without the point, and broader than long.

Knee. A joint, being geniculate.

Knob'bed. In thick lumps, as the potato.

Knot. See joints.

L.

La'biate. Having lips as in the class Didynamia.

Lacin'iate. Jagged, irregularly torn, lacerated.

Lactes'cent. Yielding a juice, unusually white like milk, sometimes red, as in the blood root.

Lac'teus. Milk white.

Lacus'tris. Growing about lakes.

Læ'vis. Smooth, even.

Lamel'lated. In thin plates.

Lam'ina. The broad or flat end of a petal, in distinction from its claw.

La'nate. Woolly.

Lance'-olate. Spear shaped, narrow with both ends acute.

Lance-o'vate. A compound of lanceolate and ovate, intermediate.

Lat'eral. On one side, (from *latus.*)

La'tent. Hidden. concealed, (from *lateo* to hide.)

Lar'va. The caterpillar state of an insect.

Lax. Limber, flaccid.

Leaf'et. A partial leaf, part of a compound leaf.

Leaf-'stalk. See petiole.

Leg'ume. A pod or pericarp, having its seeds attached to one side or suture; as the pea and bean.

Legu'minous. Bearing legumes.

Lepan'thium. A term used for a petal-like nectary; like that of the larkspur and monkshood.

Li'ber. The inner bark of plants. Immediately under the cuticle is a succulent, cellular substance, for the most part of a green colour, especially in the leaves and branches. Under this cellular integument, is the bark consisting of but one layer in plants or branches only one year old. In older branches and trunks of trees, it consists of as many layers as they are years old; the inner most and newest being called the *liber;* it is in this layer only that the essential vital functions are carried on for the time being, after which it is pushed outwards with the cellular integument, and like that, becomes a lifeless crust.

Lig'neous. Woody.

Lig'num. Wood.

Lig'ulate. Strap or ribbon like, flat, as the florets of the dandelion.

Lilia'ceous. A corolla with six petals gradually spreading from the base.

Limb. The border or spreading part of a monopetalous corolla.

Lin'ear. Long and narrow with parallel sides, as the leaves of grasses.

Lip. The under petal in a labiate corolla.

Littera'lis. Growing on coasts, or shores.

Liv'idus. Dark purple.

Lobe. A large division, or distinct portion of a leaf or petal.

Loc'ulus. A little cell, from locus, a place.

Lo'ment. A pod resembling a legume, but divided by transverse partitions.

Longifo'lius. Long leaved.

Longis'simus. Very long.

Lu'cidus. Bright and shining.

Lu'rid. Of a pale dull colour.

Lu'teus. Yellow.

Ly'rate. Pinnatifid, with a large roundish leafet at the end.

M.

Macula'tus. Spotted.

Mares'cent. Withering.

Mar'gin. The edge, or border.

Mar'itime. Growing near the sea.

Medul'la. The pith or pulp of vegetables. The centre or heart of a vegetable. Various opinions have been entertained respecting the importance of the pith; Linnæus considered it was the seat of life and source of vegetation; that its vigour was the principal cause of the shooting forth of branches, and that the seeds were formed from it. It is now generally thought that the pith does not perform so important a part in the economy of vegetation as was supposed by Linnæus.

Mellif'erous. Producing, or containing honey.

Mem'branous. Very thin and delicate.

Mes'ocarp. The middle substance of pericarp, or leaf, having the epicarp on the outer, and the endocarp on the inner side.

Mes'osperm. That part of the seed which corresponds to the mesocarp of the pericarp.

Mid'rib. The main or middle rib of a leaf running from the stem to the apex.

Minia'tus. Scarlet, vermillion colour.

Mola'res. Back teeth, grinders.

Mol'lis. Soft.

Mollus'cous. Such animals as have a soft body without bones: as the oyster.

Monadel'phous. Having the stamens united in a tube at the base.

Monil'iform. Granulate, strung together like beads.

Monocotyl'edons. Having but one cotyledon.

Monœ'cious. Having pistillate and staminate flowers on the same plant.

Monopet'alous. The corolla all in one piece.

Monophyl'lous. Consisting of one leaf.

Monosper'mus. One seed to a flower.

Monta'nus. Growing on mountains.

Moon-form. See crescent form.

Mosses. The second order of the class Cryptogamia.

Mu'cronate. Having a small point or prickle at the end of an obtuse leaf.

Multiflo'rus. Many flowered.

Mul'tiplex. Many fold, petals lying over each other in two rows.

Mul'tus. Many.

Mu'ricate. Covered with prickles.

N.

Naked. Destitute of parts usually found.

Na'nus. Dwarfish, very small.

Nap. Downy, or like fur, tomentose.

Napifor'mis. Resembling a turnip.

Narcot'ic. (From narco, to stupify.) A substance which has the power of procuring sleep—Opium is highly narcotic.

Na'tant. Floating.

Natural Character. That which is apparent, having no reference to any particular method of classification.

Natural History. The science which treats of Nature.

Nec'tary, (from nectar, the fabled drink of the gods.) The part of a flower which produces honey: this term is applied to any appendage of the flower which has no other name.

Nemoro'sus. Growing in groves, often given as a specific name, as Anemone nemorosa, the ending in *a* denotes the adjective as being in the feminine gender: the adjective in Latin varying its termination to conform to the gender of the substantive.

Nerves. Parallel veins.

Nerved. Marked with nerves, so called, though not organs of sensibility like the nerves in the animal system.

Nic'titans. From a word which signifies to twinkle, or wink; applied as a specific name to some plants which appear sensitive; as the Cassia nictitans.

Ni'ger. Black.

Nit'idus. Glossy, glittering.

Niv'eus. Snow white.

Nod'ding. Partly drooping.

Node, Nodus. Knot.

No'men. A name.

Notch'ed. See crenate.

Nu'cleus. Nut, or kernel.

Nu'dus. See naked.

Nut, Nux. See nucleus.

Nu'tant. See nodding, pendulous.

O.

Ob. A word which prefixed to other terms, denotes the inversion of the usual position; as, obcordate, inversely cordate.

Obcon'ic. Conic with the point downwards.

Obcor'date. Heart-shaped with the point downwards.

Oblance'olate. Lanceolate with the base the narrowest.

Obli'que. A position between horizontal and vertical.

Oblong. Longer than oval, with the sides parallel.

Obo'vate. Ovate with the narrowest end towards the stem, or place of insertion.

Ob'solete. Indistinct, appearing as if worn out.

Obtu'se. Blunt, rounded, not acute.

Odora'tus. Scented, odorous.

Officina'lis. Such plants as are kept for sale as medicinal, or of use in the arts.

Oid, *Oi'des.* This termination imports resemblance, as petaloid, like a petal; thalictroides, resembling a thalictrum, &c.

Opa'que. Not transparent.

Oper'culum. The lid which covers the capsules of mosses.

Opposite. Standing against each other on opposite sides of the stem.

Orbic'ular. Circular.

Orchid'eous. Petals like the orchis, four arched, the fifth longer.

Ornithol'ogy. That department of zoology which treats of birds.

Os. A bone. A mouth.

Os'seous. Bony, hard.

O'vary. A name sometimes given to the outer covering of the germ, before it ripens.

O'vate. Egg shaped, oval with the lower end largest.

Ovip'arous. Animals produced from eggs, as birds, &c.

O'vules. Little eggs; the rudiments of seeds which the germ contains before its fertilization; after that the ovules ripen into seeds.

O'vum. An egg.

P.

Palate. A prominence in the lower lip of a labiate corolla, closing or nearly closing the throat.

Palea'ceous. See Chaffy.

Palmate. Hand-shaped; divided so as to resemble the hand with the fingers spread.

Palus'tris. Growing in swamps and marshes.

Pandu'riform. Contracted in the middle like a violin or guitar.

Pan'icle. A loose, irregular bunch of flowers with sub-divided branches, as the oat.

Pan'icled. Bearing panicles.

Papil'io. A butterfly.

Papiliona'ceous. Butterfly-shaped,—an irregular corolla consisting of four petals; the upper one is called the banner, the two side ones wings, and the lower one the keel, as the pea. Mostly found in the class Diadelphia.

Papil'lose. Covered with protuberances.

Pappus. The down of seeds, as the dandelion; a feathery appendage. See Egret.

Parasit'ic. Growing on another plant and deriving nourishment from it.

Paren'chyma. A succulent vegetable substance; the cellular substance; the thick part of leaves between the opposite surfaces; the pulpy part of fruits, as in the apple, &c.

Partial. Used in distinction to general.

Parti'tion. The membrane which divides pericarps into cells, called the dissepiment. It is parallel when it unites with the valves where they unite with each other. It is contrary or transverse when it meets a valve in the middle or in any part not at its suture.

Parted. Deeply divided; more than cleft.

Patens. Spreading, forming less than a right angle.

Pau'ci. Few in number.

Pec'tinate. Like the teeth of a comb, intermediate between fimbriate and pinnatifid.

Pedate. Having a central leaf or segment and the two side ones which are compound, like a bird's foot.

Ped'icel. A little stalk or partial peduncle.

Pedun'cle. A stem bearing the flower and fruit.

Pel'licle. A thin membranous coat.

Pellu'cid. Transparent or limpid.

Peltate. Having the petiole attached to some part of the under side of the leaf.

Pendant. Hanging down, pendulous.

Pen'cilled. Shaped like a painter's pencil or brush.

Peregri'nus. Foreign, wandering.

Peren'nial. Lasting more than two years.

Perfo'liate. Having a stem running through the leaf; differs from connate in not consisting of two leaves.

Per'forate. Having holes as if pricked through; differs from punctate, which has dots resembling holes.

Pe'ri. Around.

Per'ianth. A sort of calyx.

Per'icarp, (from peri, around, and karpos, fruit.) A seed vessel or whatever contains the seed.

Perig'ynous. From peri, around, and gynia, pistil.

Pe'risperm. From peri, around, and sperma, seed; around the seed.

Per'manent. Any part of a plant is said to be permanent when it remains longer than is usual for similar parts in most plants.

Persis'tent. Not falling off. See Permanent.

Per'sonate. Masked or closed.

Pe'tal. The leaf of a corolla, usually coloured.

Pe'tiole. The stalk which supports the leaf.

Phenog'amous. Such flowers as have stamens and pistils visible, including all plants except the cryptogamous.

Phisiol'ogy. Derived from the Greek, a discourse of Nature.

Phytol'ogy. The science which treats of the organization of vegetables, nearly synonymous with the physiology of vegetables.

Pi'leus. The hat of a fungus.

Pillar. See Columella and Column.

Pilose. Hairy, with distinct straightish hairs.

Pilus. A hair.

Pimpled. See Papillose.

Pinna. A wing feather, applied to leafets.

Pinnate. A leaf is pinnate when the leafets are arranged in two rows on the side of a common petiole, as in the rose.

Pinnat'ifid. Cut in a pinnate manner. It differs from pinnate, in being a simple leaf deeply parted, while pinnate is a compound of distinct leafets.

Pistil. The central organ of most flowers, consisting of the germ, style, and stigma.

Pis'tillate. Having pistils but no stamens.

Pith. The spongy substance in the centre of the stems and roots of most plants. See Medulla.

Plaited. Folded like a fan.

Plane. Flat with an even surface.

Plica'tus. See Plaited.

Plumo'se. Feather-like.

Plu'mula, or *Plume.* The ascending part of a plant at its first germination.

Plu'rimus. Very many.

Pod. A dry seed vessel, not pulpy, most commonly applied to legumes and siliques.

Po'dosperm. From podos, a part, and sperma, seed; pedicel of the seed.

Pointal. A name sometimes used for pistil.

Pollen. Properly fine flour, or the dust that flies in a mill. The dust which is contained within the anthers.

Po'lus. Many.

Polyan'drous. Having many stamens inserted upon the receptacle.

Polyg'amous. Having some flowers which are perfect, and others with stamens only, or pistils only.

Polymor'phous. Changeable, assuming many forms.

Polypet'alous. Having many petals.

Polyphyl'lous. Having many leaves.

Pome. A pulpy fruit, containing a capsule, as the apple.

Porous. Full of holes.

Præmorse. Ending bluntly, as if bitten off; the same as abrupt.

Pras'inus. Green, like a leek.

Praten'sis. Growing in meadow land.

Prickle. Differs from the thorn in being fixed to the bark, the thorn is fixed to the wood.

Prismat'ic. Having several parallel flat sides.

Probos'cis. An elongated nose or snout, applied to projecting parts of vegetables.

Process. A projecting part.

Procum'bent. Lying on the ground.

Prolif'erous. A flower is said to be proliferous when it has smaller ones growing out of it.

Prop. Tendrils and other climbers.

Prox'imus. Near.

Pseudo. When prefixed to a word, it implies obsolete or false.

Pubes'cent. Hairy, downy, or woolly.

Pulp. The juicy cellular substance of berries and other fruits.

Pulver'ulent. Turning to dust.

Pu'milus. Small, low.

Punctate. Appearing dotted as if pricked. See Perforated.

Pungent. Sharp, acrid, piercing.

Purpu'reus. Purple.

Pusil'lus. Diminutive, low.

Puta'men. A hard shell.

Pyx'ide. From puxis, a box; name of one of Mirbel's genera of fruits.

Q.

Quadran'gular. Having four corners or angles.

Quarter'nate. Four together.

Quinate. Five together.

R.

Raceme. From rax, a bunch of grapes, a cluster; that kind of inflorescence in which the flowers are arranged by simple pedicels on the sides of a common peduncle; as the currant.

Ra'chis. The common stalk to which the florets and spikelets of grasses are attached: as in wheat heads. Also the midrib of some leaves and fronds.

Ra'diate. The ligulate florets around the margin of a compound flower.

Ra'dix. A root; the lower part of the plant which performs the office of attracting moisture from the soil, and communicating it to the other parts of the plant.

Rad'ical. Growing from the root.

——— The part of the corculum which afterwards forms the root; also the minute fibres of a root.

Ramif'erous. Producing branches.

Ramus. A branch.

Ray. The outer margin of compound flowers.

Recep'tacle. The end of a flower stalk; the base to which the different parts of fructification are usually attached.

Recli'ned. Bending over with the end inclining towards the ground.

Rectus. Straight.

Recurv'ed. Curved backwards.

Reflex'ed. Bent backwards more than recurved.

Reg'mate. From regma, to break with an explosion; name of one of Mirbel's genera of fruits.

Refrig'erant. From refrigero, to cool. Cooling medicines.

Re'niform. Kidney-shaped, heart-shaped without the point.

Repand. Slightly serpentine, or waving on the edge.

Repens. Creeping.

Resu'pinate. Upside down.

Retic'ulate. Veins crossing each other like net work.

Retuse. Having a slight notch in the end, less than emarginate.

Rever'sed. Bent back towards the base.

Rev'olute. Rolled backward or outward.

Rhomboid. Diamond-form.

Rib. A nerve like support to a leaf.

Rigid. Stiff, not pliable.

Ring. The band around the capsules of ferns.

Ringent. Gaping or grinning, a term belonging to the labiate corollas.

Root. The descending part of a vegetable.

Rootlet. A fibre of a root, a little root.

Rosa'ceous. A corolla formed of roundish spreading petals, without claws or with very short ones.

Rose'us. Rose coloured.

Rostel. That pointed part of the embryo, which tends downward at the first germination of the seed.

Rostrate. Having a protuberance like a bird's beak.

Rotate. Wheel-form.

Rotun'dus. Round.

Rubra. Red.

Rufous. Reddish yellow.

Rugose. Wrinkled.

Run'cinate. Having large teeth pointing backward, as the dandelion.

Rupes'tris. Growing among rocks.

S.

Sagit'tate. Arrow-form.

Salif'erous. Bearing or producing salt.

Salsus. Salt tasted.

Salver-form. Corolla with a flat spreading border proceeding from the top of a tube: flower monopetalous.

Sam'ara. A winged pericarp not opening by valves, as the maple.

Sap. The watery fluid contained in

the tubes and little cells of vegetables.

Sapor. Having taste.

Sarmen'tose. Running on the ground, and striking root from the joints only, as the strawberry.

Sar'cocarp. from sarx, flesh, and karpos, fruit; the fleshy part of fruit.

Sca'ber or *Sca'brous.* Rough.

Scandens. Climbing.

Scape. A stalk which springs from the root, and supports flowers and fruit but no leaves,as the dandelion.

Sca'rious. Having a thin membranous margin.

Scattered. Standing without any regular order.

Scions. Shoots proceeding laterally from the roots or bulb of a root.

Segment. A part or principal division of a leaf, calyx or corolla.

Sempervi'rens. Living through the winter, and retaining its leaves.

Serrate. Notched like the teeth of a saw.

Ser'rulate. Minutely serrate.

Sessile. Sitting down; placed immediately on the main stem without a foot stalk.

Seta. A bristle.

Seta'ceous. Bristle-form.

Shaft. A pillar, sometimes applied to the style.

Sheath. A tubular or folded leafy portion including within it the stem.

Shoot. Each tree and shrub sends forth annually a large shoot in the spring and another in June.

Shrub. A plant with a woody stem, branching out nearer the ground than a tree, usually smaller.

Sic'cus. Dry.

Sil'icle. A seed vessel constructed like a silique, but not longer than it is broad.

Silique. A long pod or seed vessel of two valves, having the seed attached to the two edges alternately.

Simple. Not divided, branched or compounded.

Sin'uate. The margin hollowed out resembling a bay.

Si'nus. A bay; applied to the plant, a roundish cavity in the edge of the leaf or petal.

So'ri. Plural of sorus; fruit dots on ferns.

Spa'dix. An elongated receptacle of flowers, commonly proceeding from a spatha.

Spa'tha. A sheathing calyx opening lengthwise on one side, and consisting of one or more valves.

Spat'ulate. Large, obtuse at the end, gradually tapering into a stalk at the base.

Spe'cies. The lowest division of vegetables.

Specif'ic. Belonging to a species only.

Sper'ma. Seed.

Spike. A kind of inflorescence in which the flowers are sessile, or nearly so, as in the mullien, or wheat.

Spike'let. A small spike.

Spin'dle shaped. Thick at top, gradually tapering, fusiform.

Spine. A thorn or sharp process growing from the wood.

Spino'sus. Thorny.

Spi'ral. Twisted like a screw.

Spur. A sharp hollow projection from a flower, commonly the nectary.

Spur'red-rye. A morbid swelling of the seed, of a black or dark colour, sometimes called ergot; the black kind is called the malignant ergot. Grain growing in low moist ground, or new land, is most subject to it.

Squamo'sus. Scaly.

Squarro'se. Ragged, having divergent scales.

Stamen. That part of the flower on which the artificial classes are founded.

Stam'inate. Having stamens without pistils.

Standard. See banner.

Stel'late. Like a star.

Stem. A general supporter of leaves, flowers and fruit.

Stemless. Having no stem.

Ster'ile. Barren.

Stig'ma. The summit, or top of the pistil.

Stipe. The stem of a fern, or fungus; also the stem of the down of seeds, as in the dandelion.

Stip'itate. Supported by a stipe.

Sti'pule. A leafy appendage, situated at the base of petioles, or leaves.

Stolonif'erous. Putting forth scions, or running shoots.

Stramin'eous. Straw like, straw coloured.

Strap-form. Ligulate.

Stratum. A layer, plural strata.

Striate. Marked with fine parallel lines.

Strictus. Stiff and straight, erect.

Strigose. Armed with close thick bristles.

Strob'ilum. A cone, an ament with woody scales.

Style. That part of the pistil which is between the stigma and the germ.

Styl'ides. Plants with a very long style.

Sua'vis. Sweet, agreeable.

Sub. Used as a diminutive, prefixed to different terms to imply the existence of a quality in an inferior degree; in English, may be rendered by somewhat: it also signifies under.

Subero'se. Corky.

Submersed. Growing under water.

Subter'raneous. Growing and flowering under ground.

Subtus. Beneath.

Sub'acute. Somewhat acute.

Sub'sessile. Almost sessile.

Sub'ulate. Awl shaped, narrow and sharp pointed. See awl form.

Suc'culent. Juicy, it is also applied to a pulpy leaf, whether juicy or not.

Suc'cus. Sap.

Sucker. A shoot from the root by which the plant may be propagated.

Suffru'ticose. Somewhat shrubby,—shrubby at the base; an under shrub.

*Sul'cate.*Furrowed, marked with deep lines

Super. Above.

Supradecom'pound. More than decompound; many times subdivided.

Superior. A calyx or corolla is superior, when it proceeds from the upper part of the germ.

Supi'nus. Face upwards. See resupinatus.

Suture. The line or seam formed by the junction of two valves of a seed vessel.

Syco'ne. From sucon a fig; a name given to one of Mirbel's genera of fruits.

Sylves'tris. Growing in woods.

Syn'carpe. From sun, with, and karpos fruit, a union of fruits.

Syngene'sious. Anthers growing together, forming a tube; such plants as constitute the class Sygenesia, being also compound flowers.

Syn'onyms. Synonymous, different names for the same plant.

Synop'sis. A condensed view of a subject, or science.

T.

Taxon'omy. From taxis, order and nomos law; method of classification.

Teeth of Mosses. The outer fringe of the peristomium is generally in 4, 8, 16, 32, or 64 divisions; these are called teeth.

Tegens. Covering.

Teg'ument. The skin or covering of seeds; often bursts off on boiling, as in the pea.

Tem'perature. The degree of heat and cold to which any place is subject, not wholly dependent upon latitude, being affected by elevation; the mountains of the torrid zone produce the plants of the frigid zone. In cold regions white and blue petals are more common; in warm regions red and other vivid colours: in the spring we have more white petals, in the autumn more yellow ones.

Ten'dril. A filiform or thread like appendage of some climbing plants, by which they are supported by twining round other objects.

Tenel'lus. Tender, fragile.

Tenuifo'lius. Slender leaved.

Ten'uis. Thin and slender.

Ter'ete. Round, cylindrical, tapering.

Ter'minal. Extreme, situated at the end.

Ter'nate. Three together, as the leaves of the clover.

Tetradyn'amous. With four long and two short stamens.

Tetran'drous. Having four stamens.

Thorn. A sharp process from the woody part of the plant: considered as an imperfect bud indurated.

Thread-form. See filiform.

Thyrse. See panicle.

Tige. See caulis.

Tincto'rius. Plants containing colouring matter.

Tomen'tose. Downy: covered with fine matted pubescence.

Ton'ic. (From tono to strengthen) medicines which increase the tone of the muscular fibre.

Toothed. See dentate.

Tracheæ. Names given to vessels supposed to be designed for receiving and distributing air.

Transverse. Crosswise.

Trichot'omous. Three forked.

Trifid. Three cleft.

Trifo'liate. Three leaved.

Trilo'bate. Three lobed.

Triloc'ular. Three celled.

Trun'cate. Having a square termination, as if cut off.

Trunk. The stem or bole of a tree.

Tube. The lower hollow cylinder of a monopetalous corolla.

Tuber. A solid fleshy knob.

Tuberous. Thick and fleshy, containing tubers, as the potato.

Tubular. Shaped like a tube hollow.

Tu'nicate. Coated with surrounding layers, as in the onion.

Tur'binate. Shaped like a top, or pear.

Twining. Ascending spirally.

Twisted. Coiled.

U.

Uligino'sus. Growing in damp places.

Umbel. A kind of inflorescence in which the flower stalks diverge from one centre, like the sticks of an umbrella.

Umbellif'erous. Bearing umbels.

Unarmed. Without thorns or prickles.

Un'cinate. Hooked.

Unctuo'sus. Greasy, oily.

Un'dulate. Waving, serpentine, gently rising and falling.

Unguis. A claw.

Unguic'ulate. Inserted by a claw.

Uniflo'rus. One flowered.

Unicus. Single.

Unilat'eral. Growing on one side.

Urce'olate. Swelling in the middle, and contracted at the top in the form of a pitcher.

V.

Valves. The parts of a seed vessel into which it finally separates; also, the leaves which make up a glume, or spatha.

Variety. A subdivision of a species, distinguished by characters which are not permanent; varieties do not with certainty produce their kind by their seed. All apples are but varieties of one species; if the seeds of a sour apple be planted, they will produce, perhaps, some sweet apples, some of a green colour, some red; there are as many trees of different kinds of fruit, as there are seeds planted. The quince is a species of the same genus, or family, as the apple; but, the seed of a quince has never been known to produce an apple tree.

Vaulted. Arched over; with a concave covering.

Veined. Having the divisions of the petiole irregularly branched on the under side of the leaf.

Ven'tricose. Swelled out. See inflated.

Vernal. Appearing in the spring.

Ver'rucose. Warty, covered with little protuberances.

Vertical. Perpendicular.

Verticil'late. Whorled, having leaves or flowers in a circle round the stem.

Vesic'ular. Made up of cellular substance.

Ves'pertine. Flowers opening in the evening.

Vil'lous. Hairy, the hairs long and soft.

Viola'ceous. Violet coloured.

Vires'cens. Inclining to green.

Vir'gate. Long and slender. Wartlike.

Vir'idis. Green.

Virgul'tum. A small twig.

Virose. Nauseous to the smell, poisonous.

Viscid. Thick, glutinous, covered with adhesive moisture.

Vitel'lus. Called also the yolk of the seed; it is between the albumen and embryo.

Vit'reus. Glassy.

Vivip'arous. Producing others by means of bulbs or seeds, germinating while yet on the old plant.

Vul'nerary. From vulnus, a wound, medicines which heal wounds.

W.

Wedge-form. Shaped like a wedge, rounded at the large end, obovate with straightish sides.

Wheel-shaped. See rotate.

Wings. The two side petals of a papilionaceous flower.

Wood. The most solid parts of trunks of trees and shrubs.

Z.

Zool'ogy. The science of animals.

Zo'ophytes. The lowest order of animals, sometimes called animal plants, though considered as wholly belonging to the animal kingdom. They resemble plants in their form, and exhibit very faint marks of sensation.

LANGUAGE OF FLOWERS.

Besides the scientific relations which are to be observed in plants, flowers may also be regarded as emblematical of the affections of the heart—and intellectual qualities. In all ages of the world, history and fable have attached to flowers particular associations; consecrating them to melancholy remembrances, to glory, friendship or love. In oriental countries, a *selam*, or bouquet of flowers, is often made the interesting medium of communicating sentiments, to which words are often inadequate.

The authorities for the emblems here adopted, are "Flora's Dictionary," "Garland of Flora," "Lee's *Vegeteux Curieux*," and "*Embleme Des Fleurs*." In a few cases, alterations have been made, in order to introduce sentiments of a more refined and elevated character, than such as relate to mere personal attractions.

Acacia. Friendship.

Acanthus. Indissoluble ties.

Aconitum. (*Monk's-hood.*) Deceit. Poisonous words.

Adonis autumnalis. Sorrowful remembrances.

Agrostemma. (*Cockle.*) Charms please the eye, but merit wins the soul.

Althea. I would not act contrary to reason.

Aloe. Religious superstition. Think not the Almighty wills one idle pang, one needless tear.

Amaranthus. Immortality. Unchangeable.

A. Melancholicus. Love lies bleeding.

Amaryllis. Splendid beauty. Coquetry.

Anemone. Anticipation. Frailty.

Arum. Deceit. Ferocity. Treachery.

Apocynum. Falsehood.

Arbor-Vitæ. (*Thuja occidentalis.*) Friendship unchanging.

Aster. Beauty in retirement.

Auricula. Elegance. Pride.

Asclepias. (*Milk-weed.*) Cure for the heart-ache. The miserable have no medicine but *hope*.

Bachelor's button. Hope, even in misery.

Balm. Sweets of social intercourse.

Broom. Humility.

Broom-corn. Industry.

Balsam (Impatiens.) Impatience. Do not approach me.

Bay. (*Laurus*). I change but with death.

Box. Constancy.

Calla ethiopica. (Egyptian lily.) Feminine delicacy.

Camellia japonica. (Japan rose.) Pity is easily changed to love.

Campanula. (Bell flower.) Gratitude.

Cape jasmine. (Gardenia florida.) My heart is joyful.

Cardinal flower. Lobelia cardinalis. High station does not secure happiness.

Catch-fly. (*Lychnis.*) I am a willing prisoner.
Cedar. (*Juniperus.*) You are entitled to my love.
China-Aster, double. (*Aster Chinensis.*) Your sentiments meet with a return.
China-Aster, single. You have no cause for discouragement.
Chrysanthemum red. Love.
Chrysanthemum white. Truth needs no protestations.
Chrysanthemum yellow. A heart left to desolation.
Clematis (*Virgin's bower.*) Mental excellence.
Cock's comb. (*Amaranthus.*) Foppery. Affectation.
Columbine, purple. (*Aquilegia Canadensis.*) I cannot give thee up.
Columbine, red. Hope and fear alternately prevail.
Convolvulus. Uncertainty.
Cornus. Indifference. A changed heart.
Cowslip. (Primula.) Native grace.
Crocus. Cheerfulness.
Crown Imperial. (Fritillaria imperialis.) Majesty. Power.
Cypress. Disappointed hopes. Despair.
Chamomile. Blooms in sorrow. Energy to act in adversity.
Carnation. (*Dianthus.*) Disdain. Pride.
Citron. Beautiful, but ill humored.
Dahlia. Forever thine.
Daisy. (*Bellis perennis.*) Unconscious beauty.
Dandelion. Smiling on all. Coquetry.
Eglantine. (Rosa rubiginosa.) I wound to heal.
Elder. (Sambucus.) Compassion yielding to love.
Everlasting. (*Gnaphalium.*) Never ceasing remembrance.
Fox glove. (Digitalis.) I am not ambitious for myself, but for you.
Fuchsia. (*Ladies' ear-drop.*) It were all one,
That I should love a bright particular star,
And think to wed it.
Geranium, fish. Thou art changed.
Geranium, oak. Give me one look to cheer my absence.
Geranium, rose. Many are lovely, but you exceed all.
Hawthorn. (*Cratagus.*) Hope! I thee invoke.
Heart's-ease. (*Viola tricolor.*) Forget me not.
Hibiscus. Beauty is vain.
Holly. (*Ilex.*) Think upon your vows.
Hollyhock. (*Althea rosea.*) Ambition.
Honeysuckle. (*Lonicera.*) I strive with grief. Fidelity.
Hyacinth. Love is full of jealousy.
Hydrangea. A boaster. Superior merit, when assumed, is lost.
Houstonia cerulia. Meek and quiet happiness.
Hypericum. (St. John's Wort.) Animosity.
Jasmine. You bear a gentle mind. Amiability.
Jonquil. (*Narcissus.*) Affection returned.
Ipomœa. Busy body. Busy bodies are a dangerous sort of people.
Iris. I have a message for you.
Ivy. (*Vitis hedera.*) Female affection. I have found one true heart.
Laburnum. (Cytisus laburnum.) Pensive beauty.
Lady's Slipper. (*Cypripedium.*) Capricious beauty.
Larkspur.) *Delphinium.*) Inconstancy. Inconstant as the changing wind.
Laurel. (*Kalmia.*) Oh what a goodly outside falsehood hath.
Lavender. Words though sweet may be deceptive.
Lemon. (*Citrus lemonium.*) Discretion. Prudence.
Lilac. (*Syringa.*) First love.

Lily, white. (*Lilium candidum.*) Purity. With looks too pure for earth.

Lily, yellow. False. Light as air.

Lily of the Valley. (*Convallaria.*) Delicacy. The heart withering in secret.

Locust, the green leaves. Affection beyond the grave. Sorrow ends not, when it seemeth done.

Lupine. Indignation.

Magnolia. Perseverance.

Marigold. Cruelty. Contempt.

Mirabilis. (Four-o-clock.) Timidity.

Mignonette. (*Reseda odorata.*) Moral and intellectual beauty.

Mimosa. (*Sensitive Plant.*) My heart is like a broken lute.

Mock Orange, or *Syringa.* (*Philadelphus.*) Counterfeit. I cannot believe one who has once deceived me.

Myrtle. (*Myrtus.*) *Love.*

Myrtle, withered. Love betrayed.

Narcissus. Egotism. The selfish heart deserves the pain it feels.

Nettle. (*Urtica.*) Scandal.

Nightshade. Suspicion. Artifice. Scepticism.

Nasturtion. (*Tropæolum.*) Honor to the brave. Wit.

Oleander. Beware. Shun the coming evil. In vain is the net spread in the sight of any bird.

Olive. Peace. After a storm comes a calm.

Orange flowers. Bridal festivity.

Parsley. (*Apium.*) Useful knowledge.

Passion flower. (*Passiflora.*) Devotion.

Peach blossom. Here I fix my choice.

Periwinkle. (*Vinca.*) Recollections of the past.

Phlox. Our souls are united.

Pine. (*Pinus resinosa.*) Time and philosophy.

Pine. Spruce. Farewell! for I must leave thee.

Pink, single white. (Dianthus.) Ingenousness. Stranger to art.

Pink, single red. A token of all the heart can keep.
Of holy love in its fountain deep.

Pink China. (*Dianthus Chinensis.*) Aversion. Though repulsed, not in despair.

Pink, variegated. *Refusal.* You have my friendship; ask not for more.

Pæony. (*Pæonia.*) Anger. Ostentation.

Polyanthus. Thou knowest my confidence in thee.

Pomegranate flower. (*Punica.*) Mature and beautiful.

Poppy, red. Consolation. Let the darkness of the past be forgotten, in the light of hope.

Poppy, white. Doom'd to heal—or doom'd to kill,
Fraught with good or fraught with ill.

Poppy, variegated. Beauty without loveliness.

Primrose. (*Primula.*) Be mine the delight of bringing modest worth from obscurity.

Primrose, evening, (*Œnothera.*) Inconstancy. Be not beguiled with smooth words. 'Man's love is like the changing moon.

Ranunculus. Flowers are beautiful, but do not, like mental beauty, delight the heart.

Rosemary. Keep this for my sake. I'll remember thee.

Rue. (*Ruta.*) Disdain. This trifling may be *mirth* to you, but 'tis *death* to me.

Rose bud. Confession. Thou hast stolen my affections.

Rose, Burgundy. Modesty and innocence united to beauty.

Rose, damask. Sweeter than the op'ning rose.

Rose, red. The blush of modesty is lovely.

Rose, Moss. Superior merit.

Rose, white. Let me be,
In maiden meditation, fancy free.

Rose white, withered. Emblem of my heart. Withered like your love.

Rose, wild. Simplicity. Let not your unsophisticated heart, be corrupted by intercourse with the world.

Rose cinnamon. Without pretension. Such as I am, receive me. Would I were of more worth, for *your sake.*

Sage. (*Salvia.*) Domestic virtues. Woman's province is *home.*

Scarlet Lychnis. (*Lychnis chalcedonica.*) I see my danger without power to shun.

Snapdragon. (*Antirrhinum.*) I have been flattered with false hopes.

Snow ball. (*Viburnum.*) Virtues cluster around thee. *A union.*

Snow drop. (*Galanthus.*) Though chilled with adversity, I will be true to thee. I am not a summer friend.

Sorrel. (Rumex.) Wit ill timed. He makes a foe, who makes a jest.

Speedwell. (*Veronica.*) True love's a holy light.
And when 'tis kindled, ne'er can die.

Spider wort. (*Tradescantica.*) The pledge of *friendship*, 'tis all my heart can give. Would'st thou then counsel me to fall in love ?

Star of Bethlehem. (*Ornithogalum.*) Reconciliation. Light is brighter when it shineth in darkness.

Solidago. (*Golden rod.*) Encouragement.

Strawberry. (*Fragaria.*) A pledge of future happiness.

Sumach. (*Rhus.*) Splendor. Wealth cannot purchase love. Have you never seen *splendid misery ?*

Sun-flower. (*Helianthus.*) You are too aspiring.

Sweet William. (*Dianthus barbatus.*) Finesse. One may smile and be a villain. I cannot smile when discontent sits heavy at my heart.

Sweet pea. Departure. Must you go ?

Stock gilly-flower. You are too lavish of your smiles.

Thistle. (*Carduus.*) Misanthropy. O that the desert were my dwelling place.

Thorn-apple. (*Stramonium.*) Alas, that falsehood should appear in such a lovely form !

Thyme. Less lovely than some, but more estimable.

Tuberose. (*Polyanthes Tuberosa.*) Blessings brighten as they take their flight.

Tulip. Vanity. Thou hast metamorphosed me ! This love has been like a blight upon my opening prospects.

Tulip tree. (*Liriodendrum.*) Rural life favourable to health and virtue.

Verbena. Sensibility. The heart that is soonest awake to the flowers
Is always the first to be touch'd by the thorns.

Violet blue. Faithfulness. I shall never forget.

Violet, white. Modest Virtue.

Wall flower. (*Cheiranthus.*) Misfortune is dear when it proves the truth of friendship.

Weeping Willow. (*Salix.*) Forsaken. Ask not one to join in mirth whose heart is desolate.

Wood-Sorrel. (*Oxalis.*) Tenderness and affection.

Woodbine. (*Lonicera.*) Fraternal love.

Water Lily. The American lotus. (*Nymphæa.*) An emblem of silence.

Yarrow. (*Achillea.*) To heal a wounded heart.

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ERRATA.

The student is requested to make with a pen, the following corrections.

Page 23—3d line from the bottom, for "*to*" insert *too*.
" 34—1st line, for "*often when*," insert *after*.
" 38—Near the middle of the page, for "*anamolous*," insert *anomolous*.
" 44—Erase the second paragraph, including five lines.
" 54—In the line above Fig. 2, for "*orated*," insert *coated*.
" "—Over the figure at *b*, for "*scaly*" insert *coated*.—Over the figure at *c*, for "*ovate*" insert *scaly*.
" 100—In the caption after Lecture XIV. erase "*s*" after Linnæus.
" 103—Erase the fifth division of receptacle; viz. *spadix*, &c.
" 104—For "*ovales*," in the 4th, 5th, 9th, and 13th lines, insert *ovules*.
" 105—3d line from the bottom for "*angyocarps*," insert *angiocarps*.
" 106—6th line from the top, for "*germ*," insert *genus*; in the next page correct the same error in the 4th line from the top.
" 111—For the caption "*Angiocarpes*," insert *angiocarps*.
" 158—7th line from the bottom, for "*compared to*" insert *considered as*.
" 161—5th line from top, erase the semicolon. In the third paragraph, for "*the three parts*," insert *these*.
" 162—At the analysis, for "*Synopsis of Jussieu*" insert *natural families*.
" 165—In the line following, class 7, for "*hypogcuous*," insert *hypogynous*; see also a similar error in the next page.
" 167—7th line from the bottom, for "*treat*" insert meet.
" 175—In the last paragraph but one, erase "*these are the plants which Linnæus calls Cryptogamous.*"
" 181—In the third paragraph from the bottom, for "*drops*," insert *droops*.
" 195—9th line from top, for "*Ophilia*," insert *Ophelia*.
" 199—At the analysis, for "*introduction*" insert *instruction*. At the analysis in the 216th page, erase *amphibious*.
" 228—7th line from top. after swell, insert *in*.
" 247—8th line from bottom, for "*natars*" insert *natans*.
" 274—Near the middle of the page, for *Bolenheim*" insert *Blenheim*.
" 293—Near the middle of the page, before "*elementary*," for "*a*" insert *an*.
" 312—for "*Septandria*," insert *Leptandria*.
" 316—for "*Metchella*" insert *Mitchella*.
" 319—for Ceanrohus, insert Ceanothus—In the same page for "*Avipelopsis*," insert *Ampelopsis*.

Class 8th Order 1st. Rhexia Virginica
Class 6th " 1 " Pontederia Cordata_ Pickerel_weed
pink & white_ Eupatorium
_ Ascelapias.

Mary L. Cobb.

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